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November-December 1984
Issue No. 13

The Independent Magazine for Users of Heath/Zenith Microcomputers

The H89's Fifth Birthday: Origins and Outlooks

Move Your Old CP/M Files to Your New Z100

Megabyte Memory for Your H8

Piggyback a Parallel Port on Your '89

Making Z-BASIC Friendlier

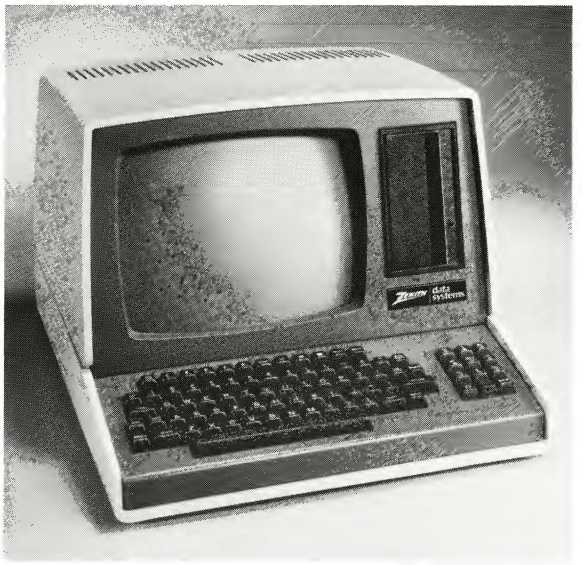

Photo courtesy of Zenith Data Systems

9

Well, it's cake and ice cream time. The H89 is five years old this year. To celebrate, we're playing "This is Your Life." We've talked to the H89's parents, teachers, and friends to get a picture of its past, present, and future. It's had a full life so far, and with the help of some dedicated vendors and owners, it should have a productive future.

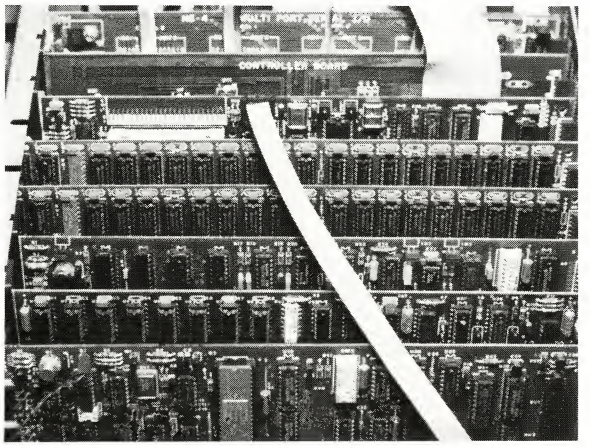

Photo by Robert Hinnard.

25

Trionyx Electronics has done it again. Their Mass Memory System is the latest addition to their campaign to prove to the world that the H8 can live forever. It gives the '8 a minimum of 128K RAM on an electronic disk emulator. (The upper memory limit will ultimately be five megabytes, in an expansion box.) It's fast, and it's quiet.

SEXTANT

Features

The H89's Fifth Birthday: Origins and Outlooks
David R. Felstul 9

Making Z-BASIC Friendlier
Sidney Hack 17
Z-BASIC can be rude. It snarls back at you when you give it bad input. And it can be boring. Every day it gives you the same copyright information you memorized months ago. And it can be stubborn. If you can't use the function keys *its* way—tough. You're stuck with them. Well, in fact, you're not. You can go inside Z-BASIC and do some brainwashing. By changing some hex codes, you can have Z-BASIC greet you with a message of your choice. You can teach it to respond politely when you've made an error. And you can reprogram its function keys to do what *you* want.

Megabyte Memory for Your H8
Robert A. Hinnard 25

Screen Out Improper Input
Kurt Albrecht 35
You've written an MBASIC program that does gymnastics with data that you (or some other unfortunate) must type in. The program works great—but you keep getting snagged on the data. You enter dollar amounts with three decimal places by mistake. Or you give it negative dollar amounts, or hit a letter instead of a number. Anyway, by the time you discover the error, your program's hung up and you've wasted a lot of time. With the MBASIC routine presented here, you can screen out those errors at the outset.

Moving Your Old CP/M Files to Your New Computer
Michael N. Rhoads 39
For years you used only an H8 or an '89. Then when the Z100 came out, you decided to move "up." You may still use the older computer, but what you really want is to be able to work on the older files on the '100. (Or vice versa?) You may have thought this could only be done over the phone with modem software. It only takes a cable and two short programs, though, and your computers can talk face to face.

Trap Errors Without Losing Error Messages
Stan Lockhart 45
Many MBASIC users have found the language's built-in error messages inadequate. Have you been tempted to write your own error-trapping routine, which would go beyond the rudimentary messages given by MBASIC? The problem is that you can't have both. Unless you have a routine that puts MBASIC's error messages into your hands, that is. Here it is.

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Introduction to Pascal: Part 3 49
William Tavolga
The semester comes to a close with the third and final article in this series on Tiny Pascal. This installment covers disk-handling techniques—how to open, close, read, and write to a disk file. Then you can try out your new knowledge reading a Tiny Pascal program—and use the program to help solve cryptograms.

Wormrace 61
Raymond Dotson
Action. Suspense. Excitement. This tiny program may keep you entertained longer than programs twice its size. And before the worms enter the home stretch, you'll have gotten a short lesson in high-density MBASIC programming.

Three Products to Write Your Letters for You 63
John S. Mays
Did you think office automation had reached its limit? That once we had word processors and electronic ledgers and "knowledge managers," the innovations would come to a standstill? Well, these three products don't just organize your thoughts—they *provide* the thoughts. All you need to add is the name and address.

Piggyback a Parallel Port on Your '89 67
Robert Shakespeare

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Cover photo by Charles Floto.

Photo by Charles Floto.

On the Cover:

Ed Byrnes has created a variety of seasonal graphics using Z-BASIC. One of the more detailed examples appears on our cover. Ed can be reached at the address and phone number of Intuitive Logic (see ad on page 42).

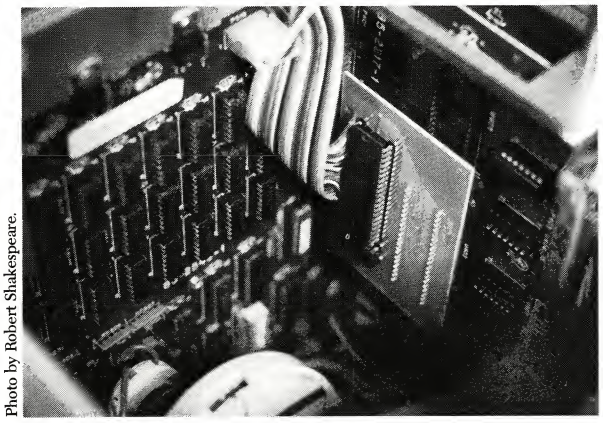

Photo by Robert Shakespeare.

67

The problem: You have a serial board in your '89. You don't need all three ports on the serial board, but you do need a parallel port. And you would prefer to save your already scarce I/O slots for later expansion projects. (Or maybe they're already full.) The solution: (1) Rub every lantern you find and hope a genie will appear and transform one of your serial ports into a parallel port; or (2) Mount a parallel interface, piggyback, on one of the serial ports. Here's how.

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The Editorial Eye

In the autumn of 1983, spirits were high within the Heath/Zenith user community. The United States Air Force and Navy had chosen the Z100 as their standard system for single-user office use. A number of colleges and universities had also picked the Z100, including one school which decided all members of each entering class should have one. The Heath Users' Group announced that members would soon be entitled to discounts of 10% on computer kits and 20% on software and wired computer products.

Only a year later, complaints, discontent, and fears abound. Version 2 of MS-DOS for the Z100 became available only weeks before the announcement that version 3 was being released for the IBM Personal Computer. While IBM stuck with its $65 price for the operating system, Zenith's price was $150—and that didn't include tools for advanced programmers which were part of the initial release of Z-DOS.

Even the International Heath/Zenith Users' Group Conference this past July was a source of discontent. Those who *went* heard officials of Heath Company and Zenith Data Systems place their hopes for future business on the IBM-compatible marketplace. Those who didn't find the Illinois location convenient enough complained that the rest of the country had been neglected in choosing the sites of the first three HUG conferences.

Some observers with a close view of the situation expect Zenith Electronics Corporation will phase out the Heath Company. If ZDS wins a large contract for computers, it may take over Heath's production resources. Speculation is that Heath may be permitted to seek alternate facilities nearby.

For unrelated reasons, it has also been speculated that the Heathkit Electronic Centers may be sold as a unit to a new owner wishing to have a large computer retailing chain. That would be one way of resolving the rivalry between Heathkit Electronic Centers and retailers independent of Zenith who sell their computers. Each group has tended to resent the other and consider itself discriminated against.

As a community of users, we can have little influence on the officers of Zenith Electronics Corporation. They have already demonstrated that they have little interest in earning our future business. They're going after what they believe to be a bigger market. Events may prove them wrong in this estimation. The Z100 may turn out to be the product that wouldn't die.

For the present, however, Zenith apparently has decided they don't need us any more. The question we must consider now is: "Do we need Zenith?"

Version 3 of the Heath Disk Operating System has been written by members of our community. Producing the code took less time than negotiating the contract. Other operating systems have been offered by independent vendors in a more timely manner than Heath/Zenith has released them. These have included CP/M, CP/M Plus, CP/M-86, MP/M, MP/M-86, and dual-processor versions for the Z100 series. The pages of *Sextant* contain ads for many other products available to us from vendors independent of Zenith Data Systems.

Nor do we need Heath/Zenith to organize conferences of users. November HUG gatherings have been put together by local groups in Northern Virginia and Southern California. (See page 85 for details.)

I hope to spark some discussion of user support independent of Heath/Zenith at the Western Regional HUG Conference. My presentation is scheduled for the afternoon of November 10th in the Disneyland Hotel. It's to be followed by a discussion of the "Impact of User Groups in the Microcomputer Industry." I look forward to being on this panel with Walt Bilofsky of The Software Toolworks and with Adam Osborne. And I hope you'll get involved in the discussion of what we as users of Zenith Data Systems and Heathkit computers can do to improve the support available to us.

Charles Floto

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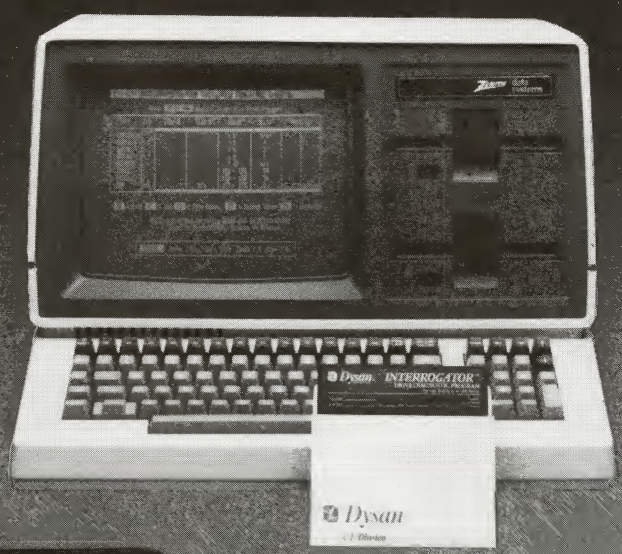

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Letters

More Screen Dump

I especially enjoyed Hugh Kenner's article on the Z67 Winchester in the July-August 1984 issue. It has inspired me to finally do something about my lack of disk space.

For the record, the name Winchester came from good old IBM where they seem to delight in numbering products but naming projects. They were working on a new disk technology and the intent was to build a disk drive that had a 30 megabyte removable disk installed above a 30 megabyte fixed disk. They called it "30 over 30," or "30/30," which inspired them to name the project after the famous rifle.

I'd also like to comment on James Hatch's letter to the editor. He commented that the line:

```
BUFFER   DS     5640
```

... could be replaced by:

```
BUFFER   EQU    *
```

This is a very good idea. However, you really should use the .SETTOP SCALL to let HDOS know how much memory you are using, or it might flop an overlay over your buffer. You should code it as follows:

```
BUFFER   EQU    *
BUF.MAX  EQU    BUFFER+5640
```

Then, during program initialization:

```
         LXI    H,BUF.MAX
         SCALL  .SETTOP
```

Thanks for another very good issue!

David A. Shaw
Elmhurst, IL

Hooked on Buffon's Needle Problem

"Buffon's Needle Problem" [*Sextant* #11, July-August 1984] had hooked me, too. But I enjoy playing with BASIC programs, so I tried telling it to keep track of how long it spent throwing needles and made myself promise to quit when I had that working well....

I've thoroughly enjoyed Dr. Knowles' article, his program, and your note following it. It's great fun to type in these little programs. They are a great way to see a different programmer's point of view and to learn a little. The short ones are seldom more than a lesson and an amusement, yet they are much easier to find time to work with since they are short enough to fit into a crowded day. I want to encourage you to continue to publish little programs, with or without short companion articles. And please continue inserting nice notes of your own, such as "A taste for pi."

The closest my H100 came to pi was a shade over 0.1% and that was on a run of only a few thousand needles. Hundred-thousand needle runs never came closer than half a percent. (That's fifty times as many needles for one-fifth the accuracy, which really brings home a lesson about probability.)

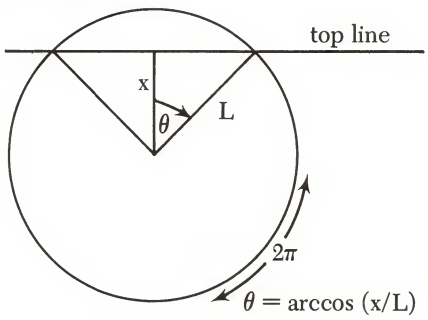
This is the first job I've given the machine to work on while I was away for a night and a day. It is exciting, in a way, to have such a faithful and efficient servant in my home. It performs my instructions tirelessly, quickly, and faultlessly. In my previous experience complex and versatile machines have almost never been, and usually aren't now, very reliable. But my Heathkit computer is slowly raising my expectations.

Colin McGowan
Philadelphia, PA

The Proof is in the Pi

I am writing in response to your short article "A Taste For Pi" in the July-August *Sextant*. I, too, was interested by Dr. Knowles' Pi program. I, however, was more interested by the formula than by the program. My last college math course was several years ago, but I decided to take a shot at proving the formula and have come up with a reasonable explanation. The following "proof" is intentionally sketchy. Anyone who understands these concepts, however, should have no problem filling in the details.

We begin by looking at one needle and using the same notation as in the article: L = length of needle and H = distance between lines. Let's say that the "lower" end of the needle lies "x" inches from the "top" line. A little trigonometry shows that if the needle lies at an angle of less than arccos (x/L) from the vertical, then the needle will cross the top line. Thus, given x, the probability that the needle will cross the top line is:



$$\frac{2 * \arccos(x/L)}{2 * PI} = \frac{\arccos(x/L)}{PI} \qquad (a)$$

Now, let's assume that the lower end of the needle may lie anywhere between the two lines, with equal probability. The distance, x, for a random needle, must then follow a "uniform" probability distribution. In other words, the probability of x being smaller than some constant A is directly proportional to A (with the probability being 0 and 1 at the top and bottom lines):

probability (x<A) = A/H

or, probability (A<x<[A + dx]) = dx/H (b)

This is all the data we need to prove the formula. Bayes Rule, the most important rule in probability theory, tells us that the probability of a random needle crossing the top line is the integral of the product of our results (a) and (b).

$$\int_0^L \frac{\arccos(x/L)dx}{PI * H} = \frac{L}{PI * H}$$

We still have to consider the bottom line. This is easy, however, since the symmetry of the lines tells us that the bottom line has the same probabilities as the top line. The total probability is the sum of the probabilities across the two lines, so we have the solution:

P = (2 * L)/(PI * H)

Having fun with my H100.

Kenton Lee
Ocean, NJ

IBM Compatibility a Big Plus

I'm afraid I must take issue with certain aspects of your profile of the new Z150, in issue #11. It seems as though your natural editorial orientation towards the more established Z100 has resulted in a certain chauvinism and bias.

Mr. Zimmerman's comments re the '150's medium-res display are indisputable, though this will be correctable through additional purchase of one of the high-res monochrome boards. As to the keyboard, that's a matter of taste—but I much prefer the '150's, even if detachability was its only advantage, which it isn't. Your photo caption on p. 9 seems to concede the great flexibility and forward-looking nature of this machine's design. My own exhaustive research, prior to opting for the '150 over the '110/120 (they led the very short list of surviving candidates), led me to the conclusion that this was indeed—all things considered—the best of the IBM-PC clones.

But I think the essential points to be made are these: virtually no one (apart from individual hackers) has been writing, much less marketing, new applications programs in CP/M, for the last two years; IBM's market-dominance gives every sign of continuing indefinitely, with PC-format being the entrenched software standard; a truly universal MS-DOS so far remains wishful thinking; there is a raging torrent of new

(and a newer generation of) 16-bit software cascading all around us, but nearly all of it will run only on the IBM PC and the most compatible of its clones. The '110/120 is doubtless a terrific machine that will be with us for quite some time, but you have to admit that all the above adds up to one hell of an equalizer.

I find *Sextant* a highly interesting publication, but before embarking upon a subscription, I'd like to know if you plan to cater at all to the expanding ranks of '150 owners. It's easy to assume that we'll be taken care of by all the PC-oriented magazines, and leave it at that. But surely there must be things unique about the Z150 (even simply by virtue of the existence of the worldwide Heath/Zenith 'network') worth reporting, and other news of interest to us.

Jordan Fox
Los Angeles, CA

We do not expect to carry reviews of software for the Z150 unless it will also be available in a version for the Z110. We have currently scheduled reviews of Word and GrafTalk, for example. We also expect to be covering Z150 hardware enhancements of particular interest to the Zenith computer community.

More Z-DOS Communications Software

The readers of *Sextant* may be interested in some unique features of ZRT communications software products for Z-DOS. [These were not included in the "Z-DOS Communications Roundup" in *Sextant* #12.] Unlike most communications software for Z-DOS, ZRT is not converted IBM-PC or CP/M software. It was developed for Z-DOS using a Z110 computer and tested extensively with IBM and Digital Equipment Corporation host systems.

The VT52 emulator and file-transfer capability of the software has been the most popular feature among the professional users of the ZRT package. Full-screen editing (including the edit keypad) and the use of other windowing utilities such as PHONE may be fully utilized when using ZRT software in conjunction with a VAX computer system. VAX users can use the command "SET TERMINAL/VT52" to enable the terminal protocol. Direct file transfers to the VAX system from the Z100 are enabled by the VAX command "CREATE$ (filename)" and the ZRT file-transfer functions. Full-screen programs and data bases are available on many other systems using the VT52 terminal protocol. (VT52 is a terminal produced by Digital Equipment Corporation, the creators of the PDP-11 and VAX computer systems.)

Another useful feature of the ZRT package is the file encryption/deciphering capability, which allows the conversion of any type of file to an encrypted ASCII file. Deciphering the file back to its original form, if one out of the possible 30,000 encryption key numbers is known, is then possible. This feature provides two useful purposes. One is, of course, privacy for text or program files transferred and stored on a host computer system. The second, not so obvious, purpose is that any type of file may be converted to an ASCII file and transferred to another system without the need for special file-transfer programs or protocols being incorporated on the host system. The file can be later retrieved and converted to a copy of its original form.

The capability to "append" or add information to any existing file at will is an important feature of the ZRT software not found with most other communication packages. This is most useful for creating information reference files directly from public or special-interest data-base computer systems.

As with other communications software, the ZRT package includes the standard "dumb" terminal emulation for use with the popular public-access systems or other microcomputers, and includes complete on-line file transfer, manipulation, and recording capabilities.

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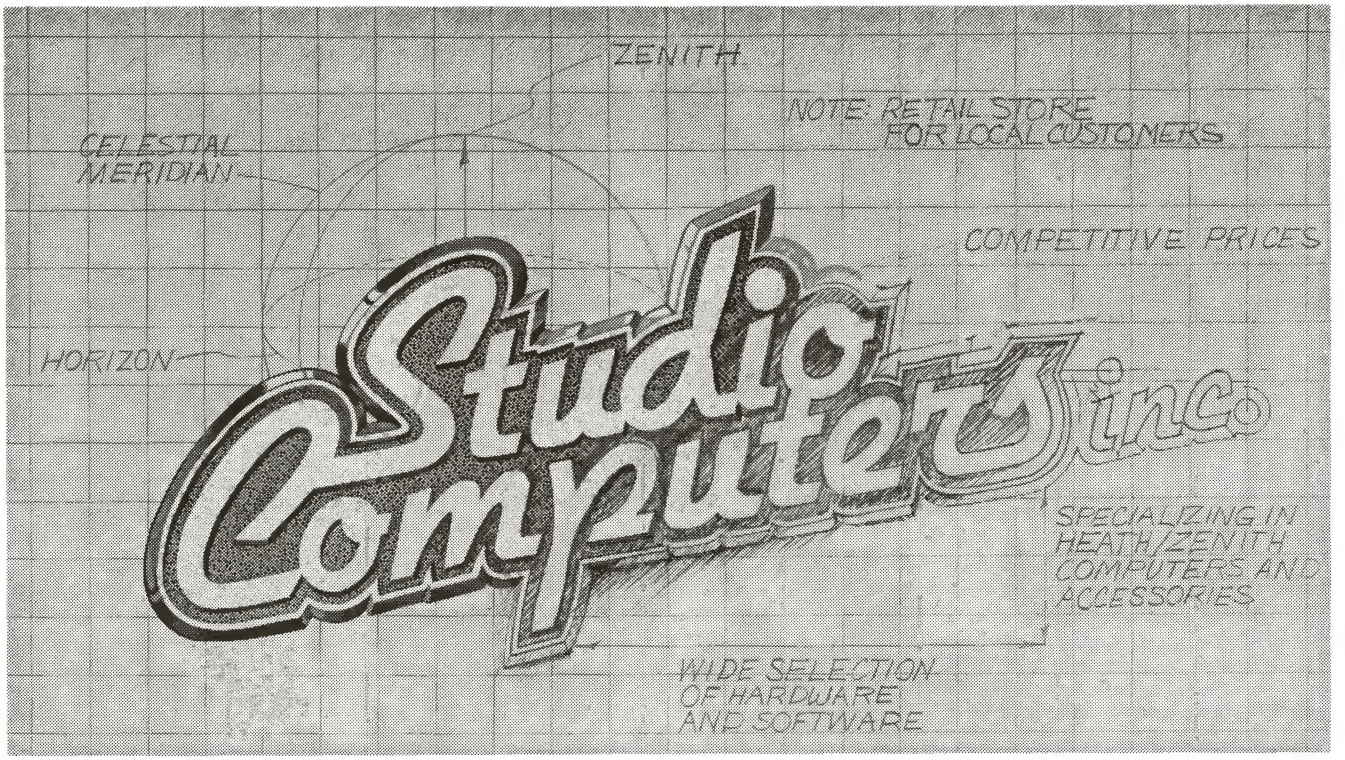

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The H89's Fifth Birthday: Origins and Outlooks

Photo Courtesy of
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May the next five years be as productive as the first five.

David R. Felstul

The Heath Company introduced the H89 computer in mid-May of 1979 at the Fourth West Coast Computer Faire in San Francisco. It was billed as the Heathkit All-In-One Computer because all of its components were completely contained within a single shell—the same shell that Heath's new H19 terminal used. This was unlike most computers of that time, which usually had several separate components. The biggest differences between it and its predecessor, the H8, were the H89's "all-in-oneness" and its central processing unit (CPU).

The H89 used the Z80 microprocessor for its CPU, instead of the H8's less powerful (and more expensive) 8080A. In fact, not only did the H89 use a Z80 microprocessor, it used two of them—one for controlling the terminal and one for controlling the computer itself. This improved the '89's processing power since its microprocessor didn't have to handle the display on the CRT screen.

Larry Plummer, who was the product line manager for Heath during the H89's development in the late 1970s, brought to light another difference between the H89 and the H8 when he told *Sextant* that the H89 was developed to appeal to a different market. Although hobbyists enjoyed buying H8s in pieces and assembling them themselves, there was a larger group of potential computer users who didn't have the knowledge or initiative for that.

The "all-in-one" H89 was designed to appeal to this group, composed largely of business and professional people. Tom Yeager, who was in overall charge of computer development at the time, remembered it this way: "our intent was to make the H89 a product that the average office worker could use."

Sextant took a survey of readers who indicated on their Reader Service Cards that they owned an H89. Heath was right—the H89's all-in-one concept did prove attractive to buyers. It was praised by people like Rodney Horner of Plum Borough, Pennsylvania, who told us that "one of the best features of the '89 is that it does not need bundles of cables to connect everything together. It is all in one."

It is somewhat ironic, however, that, having been developed for the business world, the H89 would come to be regarded as mainly a hobby computer. This seems to have happened for several reasons.

First, the business world moved away from the H89 in the early 1980s as more powerful computers became available for running word processors and spreadsheets. Also, there was never an overabundance of readily available applications software for the H89 or its factory-assembled twin, the WH89, or Z89. And what software there was, wasn't marketed in a way that attracted the possible business user to the '89. And finally, the idea of building a kit, although it had never greatly appealed to the business user, had always attracted the hobbyist.

As it was simply put by Robert Sloat of Tice, Florida, "I like to build things from kits." From Great Lakes, Illinois, Alan Beer expressed much the same sentiment when he reported, "I was pretty elated when the final pieces of the kit could be put together and [I could] start 'playing' with a computer. My elation did not subside too much when I found out that I would have to go out and buy a blank diskette just to start the operation procedures."

Not one but two Z80 microprocessors

The price of the H89 was $1,595 when it was first introduced. This price included a built-in floppy-disk system and accessory interfaces for printers, cassettes, or modems. If $1,595 was too high a price, Heathkit lovers could purchase the H89's twin, the H88. The H88 cost $1,195 but it didn't include the floppy-disk system. The H88 user, instead, had to use cassette tapes for storage. This method was slower but, of course, cheaper.

By integrating all the pieces, Heath hoped that the resulting all-in-one machine would give buyers more features for their money by making the H89 simpler, and thus less expensive. This was one of the reasons for using the twin Z80 microprocessors. According to Larry Plummer, the "two Z80s were seen as a simplification from our point of view. We had to put the CRT and computer circuits on separate boards anyway—and it was easier to put a microprocessor on each board than to connect the two boards with all the necessary hardware." Designing the H89 with twin microprocessors also resulted in a hardware configuration for the H89 that made it "totally H8 compatible so it could run the H8 software."

Using a separate Z80 microprocessor to control the terminal display had another big advantage as well. As Tom Yeager recently pointed out in a telephone interview, "the dual Z80s made the terminal independent of the computer. We thus killed two birds with one stone, marketing the all-in-one computer as the H89—and the terminal, by itself, as the H19." The '19 subsequently became one of the computer industry's most popular terminals.

The decision to use dual Z80s was not without its drawbacks, however. Barry Watzman, who took over the job of Heath computer product line manager in November of 1980, felt that the twin Z80 microprocessors "were a mistake. They were slower than memory-mapped video, which might have been better performance-wise." Mr. Watz-

man also pointed out that using the extra Z80 chip added quite a bit to the H89's cost, since microprocessor chips were still relatively expensive in the late 1970s.

Memory and software limitations

The H89's 16 kilobytes of random access memory—expandable to 48K—was an improvement over what was probably the weakest point of the H8, its limited memory. The H8 originally could muster only 8K per memory board. This sharply reduced the H8's possible uses. More powerful software couldn't fit in the limited memory. But, at the time, designers hadn't yet seen the need for more memory.

At first, the H89 didn't take much advantage of its larger memory size. It was still dependent on the software developed for the H8, software which didn't make full use of the H89's increased abilities. When it was first offered, the H89 had only Extended Benton Harbor BASIC, assembly language (HASL-8), a text editor (TED-8), and a console debugger (BUG-8) available for use with it.

Some things never change. '89 owners still complain about the limited amount of memory and software available for their machines. Dr. Robert Telepak of San Antonio has an '89 for word processing and an Apple IIe for his children. In comparing the two, he writes that the Apple "is a technically inferior machine to the '89—but it has a ton of software available"; whereas software for the '89 is somewhat limited. (I might point out that this tends to be more the case if you don't have CP/M for your '89 or if you use only 5¼-inch hard-sectored disks.)

The CP/M controversy

In the fall of 1979, '89 owners didn't see much in the way of obvious changes—except for an increase in the '89's price, to $1,695. But a lot was happening behind the scenes.

Zenith Radio Corporation decided to enter the computer market and in 1979 they acquired the Heath Company along with Heath's computer designs. A new division of Zenith, Zenith Data Systems, was formed in November of 1979 to collaborate with its newly acquired subsidiary.

The '89 was also going through many changes. There was disagreement between Heath and ZDS factions over whether to stick with the Heath Disk Operating System (HDOS) or upgrade the '89 to come with 64K of memory and the CP/M operating system. Going with CP/M was an attractive prospect since it would open up a wide variety of software for '89 owners, and installing 64K would also help the '89 run more powerful software.

Tom Yeager recalls the CP/M controversy. "In hindsight, either we were too late in making CP/M available or the HDOS source code should have been made available sooner." This would have helped spur software development for the '89 by the end user—a necessity since, in Yeager's words, "we were the new kids on the block and people weren't as willing to write software for HDOS."

Yeager explained Heath/Zenith's reasons for not making the HDOS source code immediately available. "Originally we were overly protective of the HDOS source code because we were concerned about giving end users too much to hurt themselves with. It would have been difficult for us to support all the changes they would have made in their machines' operating systems."

"In hindsight, either we were too late in making CP/M available or the HDOS source code should have been made available sooner."

There was yet another wrinkle to the argument. Heath could not provide the source code for CP/M to '89 owners. If CP/M became the operating system of choice for the '89, the lack of available source code would be a hindrance to hobbyists, programmers, and others who wanted to modify the workings of their '89s.

Finally, in early 1980 it was decided to go with CP/M, and by late 1980, Heath offered the CP/M operating system to '89 owners—well after Magnolia Microsystems, an independent supplier, had begun offering their own standard CP/M for the '89. At about this same time, Zenith Data Systems took over development of the '89 from Heath's computer division.

Decision against 4 MHz

But the '89's problems weren't over yet. In 1979, the Federal Communications Commission was in the process of setting permissible radio frequency radiation limits for computing equipment. Heath engineers had seen the "handwriting on the wall," as Tom Yeager put it, and had begun the arduous process of redesigning the '89, even before the FCC's new standards went into effect.

They took several steps to meet the FCC requirements. At a meeting in November 1980—called to discuss the redesign of the '89—Barry Watzman took the opportunity to suggest other improvements be made on the '89 as well.

The internal clock which controls the '89 was originally designed to run at a frequency of 2 megahertz. Watzman suggested that the '89 be upgraded to 4-MHz operation to improve its computational speed and increase its consumer appeal. But because of time constraints in meeting the interference standards, the engineers in charge of the project decided not to upgrade the '89 radically. Instead, they employed a quick fix that Yeager recalls as a "brute-force method"—simply adding a heavy shield around the circuitry to block the escaping radiation. Later, Heath used more finesse, changing the circuitry layout and, finally, the video display itself. But Heath never did upgrade the '89 to 4-MHz operation.

The decision not to upgrade was a difficult one to make; but as Larry Plummer points out, "the RAM refresh was done by the Z80 chip, which was a rather crude method. The speed requirements of the RAM chips, therefore, couldn't have been met with the crude timing of the '89."

Barry Watzman told us that the effects of this decision were difficult to gauge. In his words, "this decision may have shortened the '89's lifetime—or it may have prolonged it. The delay that would have resulted from upgrading to 4 MHz might have killed the '89 if it had been attempted. Still, the '89 is an 8-bit machine, so that may have killed it anyway."

Most of this inner turmoil was not visible to the outside world. Indeed, the future of the '89 looked as rosy as ever. By Christmas of 1980, the '89 community had seen a big increase in the amount of hardware available for use with the '89. The '89's standard 16K RAM was now expandable to 64K. The H47, an 8-inch floppy disk system, was now available. It was a dual-sided, double-density, dual-drive system and it dramatically increased the disk storage space available to '89 users. A wire-wrapping board and an anti-glare CRT filter were also offered that Christmas.

Even more remarkable changes had taken place in the amount and quality of software offered. The Heath catalogue now listed UCSD Pascal and Softstuff software. Independent programmers, too, had finally had a chance to catch up with the '89's designers and had begun to offer many software products.

The independent suppliers arrive

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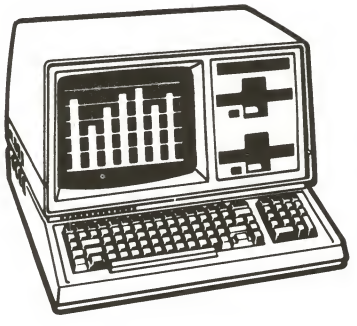

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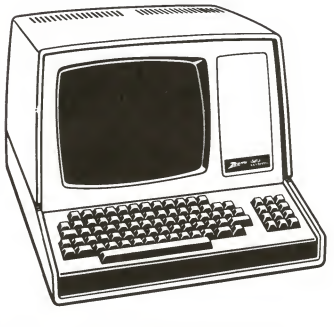

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'89 owners have demanded. From a very early date, though, independent dealers have stepped in to fill this gap.

The '89 computer was introduced in mid-1979; by the end of the year, a fair amount of hardware and software were already being offered by independents. Many of the names involved are still familiar to the '89 user. For hardware: D-G Electronic Developments Company, FBE Research Company, Floppy Disk Services, Magnolia Microsystems, and New Orleans General Data Services. For software: SoftShop, The Software Toolworks, Newline Software, and T & E associates.

One of the independent suppliers we contacted, Mark Wolinsky of Floppy Disk Services, relates the following about the inadvertent start of his company's involvement with the '89. "The first manufacturer we signed a contract with was Siemens Corp. Little known to us at the time, the FDD-100-5 disk drive that we were selling was the same one that Heath was putting in their '89. A member of the Capital Heath Users' Group in Washington contacted me at the time; and a long relationship with the Heath/Zenith people began. It seems that we were selling the disk drive for over $200 less than Heath themselves. And so was born our venture into the Heath/Zenith world."

Another independent supplier, Walt Bilofsky, founder of The Software Toolworks, received his '89—which he promptly named Leonard—in the fall of 1979 and found that he needed software. At that time, the CP/M operating system was not yet available for the '89. (Magnolia Microsystems hadn't yet introduced its standard CP/M for '89s—that didn't happen until January of 1980. And an earlier version of CP/M for the '89, from Lifeboat Associates, was non-standard and would not run many CP/M programs.) So, as Bilofsky puts it, "in late 1979, the only way to run '89 software was under HDOS, and the only way to get that software was to write it. This was the single most important factor in the birth of The Software Toolworks." (Leonard, by the way, went on to become something of a cult figure, appearing on T-shirts across the country.)

Bilofsky offered to sell his first few programs to fellow '89 users through *Buss: The Independent Newsletter of Heath Co. Computers*. Upon returning from a business trip, he "found a mailbox stuffed with checks. It then dawned on me that I was in the software business."

The Software Toolworks has grown tremendously from that modest start. This last June they shipped their 100,000th piece of software and they now supply software for many other types of computers as well as the '89. As reported in "Buss Bits," in *Buss* #86, The Software Toolworks is now one of the hundred largest software publishers in the country. Have they thus outgrown Heath/Zenith? Bilofsky's reply is reassuring, "Heath/Zenith support has always been and continues to be our main business."

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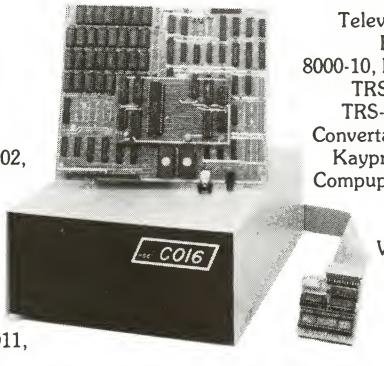

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MBASIC in the '89's ROM?

Also by 1980, the Heath Disk Operating System had been updated to handle as many as three disk drives. This new version of HDOS, Version 2.0, also included the ASM assembly language, a two-pass absolute 8080 assembler, and EDIT, a text editor. A Microsoft BASIC language interpreter was also available.

H89 owners who remember feeling that "it's about time that Heath had MBASIC" might be interested in knowing that the '89's designers at one point intended that the '89 have MBASIC reside in 16K of read-only memory—located in those three expansion slots in the left-hand side of the '89's frame. This idea never materialized, however.

When asked about this, Tom Yeager replied that "we had only talked about MBASIC in ROM, but never decided to implement it. We had put the expansion slots in, though, just in case."

The dawn of the Z100

The development of products for the '89 rolled on. Zenith, which had acquired the Heath Company less than two years previously, had lost no time in renaming the fully assembled versions of Heath's computer products. The Z19 terminal, Z89 computer, and Z87 and Z47 disk drives were first offered in the Fall 1981 Heath catalogue. In addition, Zenith pledged its continued support for Heath customers and their kits.

Although Zenith continued to support the '89, by the early part of 1981, the development emphasis had already shifted from a possible 4-MHz '89 to

the 16-bit Z100.

By Christmas of 1981, the '89's price was raised to $1,895. But it now came with 48K of memory as standard and you could still expand it to 64K. The H37 disk drive provided 1.28 megabytes of on-line data storage. The 8-inch Winchester disk drive, the Z67, provided even more data storage—nearly 11 megabytes worth. That's incredible—if you consider that, just a few short years before, the only disk storage that Heath offered was 100 kilobytes per hard-sectored disk.

A lot of new software for the '89 was also introduced that same Christmas. Some big names had taken notice of the '89. SuperCalc, Condor, DataStar, WordStar, and Magic Wand had all been adapted for use on the '89. By this time, there was a good software library available from the national Heath Users' Group, as well. It provided '89 users with lots of additional software at a minimal cost.

On the surface all was calm. The '89 was now available in just about any hardware configuration imaginable and state-of-the-art software was available for it. But just out of sight, the Z100 series was rapidly nearing completion. Due to be introduced in 1982, the Z100 with its 16-bit (as well as an 8-bit) microprocessor was much more powerful and had a great deal more memory than the '89—128K standard versus 64K. Business users seemed ready to desert the '89 in favor of its younger sibling. By the end of 1982, a bleak future for the '89 seemed certain.

The '89's decline

Christmas of 1982 signalled the end of the '89's role of flagship for the Heath/Zenith computer line. The Z100 series had been introduced at $4,000 and the '89's price dropped to only $1,400. By early 1984, the '89 was listed for only $1,100. Although clearly an outstanding price for a very good machine, Heath users still hesitated. Was Zenith going to continue supporting it? Once again, they said they were, but many indications seemed otherwise.

Zenith stopped producing the Z89. They also signed a contract in 1983 to supply the Air Force and Navy with over 6,000 Z100-series computers. The newest version of HDOS, Version 3.0, that had been promised (sort of) since the first National Heath Users' Group Conference in August of 1982, had yet to materialize. And the source code for HDOS version 2.0 was no longer available from Heath/Zenith. (Top officials at Heath/Zenith in the early 1980s had assumed that HDOS 3.0 would soon be released and they didn't want to get stuck with a lot of outdated Version 2 manuals.)

The Z100 series began to take over the Zenith assembly lines. The Z150, an IBM Personal Computer clone, was also in the works. Would Zenith just forget about the '89 user?

The answer, happily, is no. Although the Z110 has become the flagship of the Zenith computer line and the Z150 series is now in production, a look at the Fall 1984 Heath catalogue should reassure you that Heath/Zenith has not forgotten about the '89.

As shown in Heath's Fall 1984 catalogue, you can still buy the '89 in kit form at a cost of only $899. That's quite a decrease from its original price of $1,595. And for the first time, Heath has started to distribute Heath/Zenith-specific third-party '89 software and accessories through their catalogue. These include hardware accessories to correct some of the perceived limitations of the '89. The D-G Super 89 enhanced processor board with 128K RAM and 4-MHz operation is offered—and so is the 128K RAM board from Magnolia Microsystems. There is software as well, from The Software Toolworks.

Reminiscing with the proud "parents"

Only $899 for the '89 and lots of available hardware and software to boot. That's not bad for a five-year-old computer. Its "all-in-one" concept may no longer be unique. The IBM Personal Computer and its clones may have taken over a lion's share of today's microcomputer market. But the '89 still has many devoted users. In a field noted for overnight obsolescences, the '89's longevity has surprised many people—not least of whom are the '89's parents, the people who designed the '89 a little more than five years ago.

Larry Plummer recently commented that he and the other '89 designers never planned a date for obsolescence. Nonetheless, they had assumed that the '89 would have the lifespan of a typical microcomputer of that time—about two years. "I am surprised that the '89 has been around so long," Plummer stated. "But the '89 is the kind of product that survives for a long time. It's a good value for your investment. Its shortcomings in speed, disk capacity, and memory have been corrected over time. And it can run CP/M software for a lot of applications."

Barry Watzman also feels that the '89 was a good machine for its time. "It was extremely user-friendly and reliable so it was good for the naive or first-time user. Its all-in-one concept was good for its '79-'82 heyday."

Tom Yeager feels that the '89's longevity has been due to several things. "It was introduced into the early desktop computer market when a product line lasted for a longer time than it does presently. Later, as the market matures, you have to reduce cost to stay competitive and Zenith Data Systems did just that." Yeager is sure that "we made the right decisions, even if a bit too slow."

We spoke with the design engineer for the '89, Harry Archer, who recalled his feelings at the '89's birth. He simply said "We were pretty proud of the thing when we first got it put together."

Independent support—the key to past '89 success

Heath has repeatedly pointed out that it will continue to supply spare parts and other support for seven years after production of the H89 stops. Independent suppliers will also continue to satisfy the needs of '89 owners. Their support is crucial for the '89's continued existence—because any further development will probably have to come from them. To get their ideas of how the future looks for the '89, I contacted many of those independent firms who have grown up with Heath computers.

Walt Bilofsky of The Software Toolworks gave the following as his view of the '89's future. He realizes that the '89 has drawbacks in today's market. But he feels that price reductions and the huge number of enhancements offered still make the '89 a good value. And because of the "large number of '89s and other CP/M-based computers in use, The Software Toolworks intends to continue software product development for these machines in parallel with the newer 16-bit computers.... The '89 helped make The Software Toolworks what it is today, and we will always owe it a lot."

Ken Halbasch, the general manager of Secured Computer Systems, reports that his firm has two computer peripheral products for the '89 that they will continue to market. They are also actively developing more products, two of which are about to be released. Halbasch adds that "our support does not end with the development and sale of

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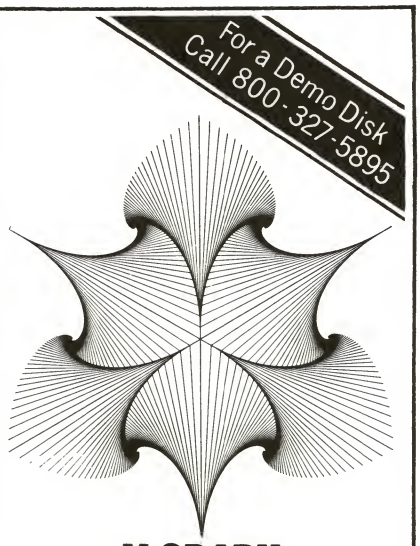

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peripheral cards but includes service of these machines."

Like the other two companies, Floppy Disk Services is still developing new products for the '89 and, according to Mark Wolinsky, "as long as the demand is there, we will supply." He feels that the '89 has "a long future even though Heath will stop making them. The old adage 'If it works, leave it alone' applies. Work well it does!"

The '89 owner—the key to future success

"As long as the demand is there...." It sounds as though the '89's future is in the hands of its owners. And just who are these people? Well, judging by the 35 or so responses we received to our survey letter, the typical '89 owner might be described as follows.

His average age is 44 years—although the actual ages range from 23 to 72. (And yes, it is definitely "his." We received no replies from women who owned an '89.) Most '89 owners have some education beyond high school, such as technical school or college. As one might suspect, most '89 owners have scientific or technical occupations. And the majority of them bought their '89 between 1980 and 1982. A statistic of particular interest is that more than one-third of the '89 owners who responded to *Sextant*'s survey obtained their '89 through a National Technical Schools program—usually paid for by veterans' educational benefits.

H/Z89 owners mentioned many strengths of their computer. Reliable, adaptable, and well documented were a few of the more common adjectives used. But owners were also quite vocal about the '89's faults. Lack of software and enough disk storage space were the two faults most frequently mentioned.

Thus, there appears to be some ambivalence in '89 owners' feelings towards their computers. It seemed as if they have to work harder to get results from their sometimes stubborn '89—but when they do put in that extra effort the '89 is worth it. Robert Weber (Phoenix, Arizona) may have expressed these mixed feelings best when he wrote, "I have found my H89A to be a very worthy opponent. It teaches me humility and patience—just the thing after a hard day of work." Regarding his opponent's future, Weber was not so optimistic, however.

Weber, and several others, compared the '89's future prospects to those of the H8, which the Heath Company no longer produces. Weber made the observation that "the new toys get the most grease." Donald Leach of New Martinsville, West Virginia, also sees the '89's future dimmed by the rise of the H/Z100 series. Because of the '100 series and the IBM PC craze, he feels that "in the next 1½ to 2 years Heath will no longer offer the '89."

R. A. Mains, a technical writer from Chula Vista, California, probably gave the most pessimistic, as well as the shortest, answer when asked to comment on the '89's future. His reply? "Ancient History."

Is it all over, then?

Most of the respondents were more optimistic than Mr. Mains, however. According to Bob Smay of Satsuma, Alabama, "there will still be a place for the '89 in the next couple of years. There are still PETs and Apple IIs out there that have been upgraded."

Several other '89 owners plan to keep their '89, upgrading it until "it finally dies," as William Raisner (Redlands, California) put it. He loves the new stuff, "but replacing one working system with another just because it is new is not reason enough for me."

Henry Milam's reply showed just how attached a person can get to his '89. "I really feel bad about getting another computer not compatible with the '89. It has served me well and it seems I am replacing it for no fault of its own. I gave it birth and it has done everything I have ever asked it to and hasn't complained a bit.... I don't intend to get rid of the '89, but realize that may come to pass some day as another takes more of my time.... But for now, the '89 and I will continue our love affair." (I hope Dr. Milam can survive what he sees as the impending separation from his H89. I should point out that as a Journalism professor at Drake University, he has a professional advantage over most people when it comes to making his story sound heart-wrenching.)

Many other readers also plan on keeping their '89s around for a few more years. Lt. Col. Herb Rosenthal (USAF), stationed in Atka, Alaska, expressed it this way, "I have no immediate intent to leave the '89—I drive my cars for 10 years—so why not the computer?"

One of the reasons the '89 may be around for a while longer is the availability of the source code for HDOS. (HDOS 3.0 is now in the advanced stages of development. Until it's released, you might find someone who purchased the source code for HDOS 2.0, and look at their copy. Try your local HUG.) HDOS is the only major operating system today that you can obtain the source code for. Therefore, for people like hobbyists, who really want to understand how their computer works, the '89 is still young.

What will become of the '89, then? In Henry Milam's words, "There'll always be some around—like mine. Maybe someday they will end up in museums. Otherwise, I guess they will go the way of the Model A Ford—there'll always be a few around loved by their masters."

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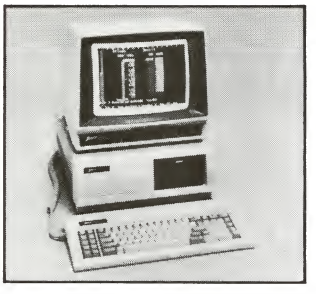

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Making Z-BASIC Friendlier

By changing some hex codes in Z-BASIC, you can substitute more useful messages and commands.

Sidney Hack

Does Z-BASIC's "?Redo from start" message annoy you as much as it does me? If you've ever typed in a letter when Z-BASIC expected a number you know what I mean.

Or would you like to permanently change any of Z-BASIC's function keys on your H/Z100, so they'd be more responsive to your needs? And so you wouldn't have to reprogram them every time you enter Z-BASIC?

And when you call up Z-BASIC, how would you like to have some useful information displayed? (Instead of just the copyright notice that shows up now.)

Last, do you have any pet programs in Z-BASIC that you would like to run from a cold start without having to type in any command at all? One that I rely on, for instance, sets up my printer.

Why change them?

The all-too-familiar "?Redo from start" is Z-BASIC's abrasive way of telling you that you have given it bad input.

It's an ill chosen message because two of the three words are wrong. The peremptory "Redo" more likely means that you should make a valid entry; while "start" is almost always inappropriate (except in the first line of a program, perhaps).

"BAD ENTRY" or "BAD INPUT" would probably be a better way for Z-BASIC to let you know your error.

Next, there are the function keys. It's convenient just to hit one of the Z100's special function keys to input frequently used Z-BASIC commands. As the function keys are set up in Z-BASIC, they have the familiar capabilities that you can see on the 25th line by typing KEY ON or CTRL-T. (Only function keys 1-10 are displayed, however.)

But if you're like me, you may prefer to dispense with some of Z-BASIC's choices in favor of your own. Reprogramming them in Z-BASIC is an easy matter, but irritating if you have to do it every time you run a program that requires a new set of functions for some or all of the keys.

And as programmed by Z-BASIC, the function keys only provide input of up to 15 characters. With little trouble, though, you can have several of them accept 30 or more characters.

Another change you can make to Z-BASIC will cause it to display some useful information each time you enter it, instead of giving you the current sign-on announcement.

What sort of message would one program here? Well, it could be some kind of reminder to yourself about your programs on the disk, or instructions that you don't want to forget. It could even be a command to display function keys on the 25th line. Or you could turn off the key click, etc. In short, anything that will fit into the available space and be useful to you.

Finally, we come to running a program upon boot-up. For that, we need AUTOEXEC.BAT. This utility comes with the Zenith Disk Operating System (Z-DOS). It permits you to run a program automatically after the operating system loads. You'll find it on Z-DOS Distribution Disk 1. The Z-DOS manual explains how you can move right into a program from a cold start. But you can also set up AUTOEXEC.BAT to run a program within a program—such as calling up Z-BASIC and then also going right into your favorite Z-BASIC program.

Be certain that you use a disk whose contents you can afford to ruin.

The program you choose to run on boot-up is up to you. It might be one like my printer-control program, or it might just be Z-BASIC itself—anything you want done every time you start up.

If any of these changes interest you, come along on a short journey in and around ZBASIC.COM and AUTOEXEC.BAT. We'll look at them with DEBUG, which comes with Z-DOS.

DEBUG—and a warning

Briefly, we are going to use DEBUG to go "inside" both ZBASIC.COM and AUTOEXEC.BAT and change the code that makes up these programs.

DEBUG is a powerful Z-DOS utility that can be helpful in dozens of ways. Its uses are spelled out quite completely in Zenith's manual for Z-DOS.

For the changes to be made here, however, you will need to use only a few of its functions—"D" to DUMP (display) the code that makes up a program; "S" to SEARCH for any particular string; "E" to ENTER new code; "W" to WRITE the code to disk; and "Q" to QUIT.

First, though, some ground rules.

For what we are going to do, absolutely and positively be certain that you use a disk whose contents you can afford to ruin. I don't want to over-emphasize the hazards of making these changes—but there is always the possibility of error. (Changing the wrong code could produce some really spectacular results. And you surely don't want to ruin your only copy of Z-DOS or Z-BASIC.)

Set up a new disk with the operating system, DEBUG.COM, and ZBASIC.COM—plus any other programs you'd like on it (such as CHKDSK.COM, EDLIN.COM, etc.). But don't add AUTOEXEC.BAT as yet.

We'll go looking for the hexadecimal equivalents of ordinary ASCII characters. And then input our new messages, also in hex. While you're doing what follows, you may think that there must be an easier way than DEBUG to make these changes. DEBUG is a bit slow and a bit awkward.

You may want to use your editor or word processor to do the job. Finding the messages and changing them that way might be a lot easier. You may be able to do so. Then again, you may not.

Some editors won't let you input hex numbers. Others may misread a control character in ZBASIC.COM as an end-of-file marker and give you only part of the file. For whatever cause, you can get some "funny" results.

Nevertheless, it might be worth trying to make the changes with your editor or word processor. But I suspect most of you will have to come back to DEBUG.

In any case, remember the first rule: *work only with a disk you can afford to ruin.*

Changing "?Redo from start"

Let's take the changes one at a time. How about "BAD INPUT" instead of "?Redo from start"? And while we're at it, let's have it show in reverse video so it will catch the eye.

To do that, follow me through these steps:

After loading Z-DOS, call up DEBUG

with ZBASIC.COM as the program to be worked on. At the Z-DOS prompt, type:
DEBUG ZBASIC.COM <RETURN>.

The following will appear on the screen:
DEBUG version 1.08
>

Next, we will want to go to the location of the "?Redo from start" message. In my version of Z-BASIC, it starts at hexadecimal address 165B and goes to hex address 166D. So to display this, type:
D165B 166D <RETURN>
What you see on the screen should look basically like the output shown in Figure 1.

What DEBUG is showing you is a two-line dump of machine language. On the right is the English translation of printable characters.

What is on your screen will differ from Figure 1 in that there will also be four characters beyond the four characters at the left edge of the display as it is shown here. Together, these leftmost eight characters will be divided by a colon (for example, 09D3:165B). They identify the segment (09D3) and the address (165B) that contains the first hexadecimal number shown in the line of hex numbers that follows immediately. (The segment number may be different on your computer from what it is on someone else's, so it has been omitted from the figures shown here.)

If your screen display differs from that part shown in Figure 1, you probably have a different Z-BASIC release. (But don't despair, I'll show later on how you can find the equivalent location in your version.)

You can now change "?Redo from start" to anything you like—so long as you don't use more characters than the message presently uses. Assuming you go along with my "BAD INPUT", we can enter the new message, beginning at address 165B. Type:
E165B <RETURN>
DEBUG will respond with the segment and address again and the hex number that appears at 165B:
XXXX:165B 3F
(There will be numbers where I've given X's.)

Now we can enter new code, starting with a replacement for 3F. But from now until you are finished entering new code, stay clear of the <RETURN> key. After each pair of characters to be entered next, you have to press the *space bar*. What you will be entering are new hexadecimal numbers representing escape codes and letters.

Enter the series of hexadecimal numbers found in Figure 2, pressing the *space bar* after each couplet. As you enter the new number and hit the space bar, DEBUG will jump ahead and show you the next hex number that is presently there. After you're done, you can check your entries by telling DEBUG to dump the changed section to the screen.

```
165B 3F 52 65 64 6F                                    ?Redo
1660 20 66 72 6F 6D 20 73 74-61 72 74 0D 0A 00         from start...
```

Figure 1. Output displayed by DEBUG for hexadecimal addresses 165B through 166D in ZBASIC.COM. This is the location of the "Redo from start" error message. (On your screen, you will also see a four-digit number repeated down the far left and separated from the address by a colon. We cannot predict what this will be for your machine, so it has been omitted from the figures presented here.)

```
20 20 20 1B 70 42 41 44 20 49 4E 50 55 54 1B 71 <RETURN>
sp sp sp ESC p  B  A  D sp  I  N  P  U  T ESC q
```

Figure 2. A replacement for the "Redo from start" message. The unshaded portion is hexadecimal code to be written into ZBASIC.COM by means of DEBUG. Its ASCII equivalent is shown shaded.

Type:
D1650 <RETURN>
(Given just a beginning address after the D, DEBUG will display 128 bytes.)

Then double-check to make sure the line appears as you wanted it. If you've made a mistake, not to worry. Just start over by typing E165B again.

When you are sure that you've got it right, type:
W <RETURN>
The changes will be written to disk. Now quit by typing:
Q <RETURN>
You'll then be at the Z-DOS prompt. Go into Z-BASIC, start to work on a program, and deliberately make an erroneous entry, such as a letter where a number is called for. See if you don't like the highlighted BAD INPUT that Z-BASIC prints on your screen.

A different version?

If you didn't find "?Redo from start" when you dumped D165B, you will have to SEARCH for it. At the DEBUG prompt, type carefully and exactly:
S0 9000 "?Redo from start" <RETURN>

	2	3	4	5	6	7
0	space	0	@	P	`	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
A	*	:	J	Z	j	z
B	+	;	K	[	k	{
C	,	<	L	\	l	|
D	-	=	M	]	m	}
E	.	>	N	^	n	~
F	/	?	O	_	o	.

Table 1. Hexadecimal equivalents of the ordinary ASCII character set. Most significant digits are along the top, least significant along the side. So the hex equivalent of V is 56.

Now DEBUG will find the right spot and identify it for you. As an example, assume that DEBUG finds "?Redo..." at hex address 185B. In that case, you would use the process I described above to insert the new message starting at 185B—the location DEBUG found for you. Just be careful to make entries in the right addresses.

There is a remote possibility that DEBUG will identify more than one location that contains a message you search for. In that case, try changing the first one and observe the effect. If nothing happens, change the code in the next one.

I suspect that the chance of finding a second "?Redo..." in Z-BASIC is just about nil. But I've run into duplicate code in a number of programs. Sometimes it's "leftover" code that a programmer didn't take the trouble to delete (as in one release of WordStar I have). In other cases, it's in a buffer, video memory, etc. So I think it's a good idea to consider the possibility of duplicate code. You're more likely to find it if you subsequently fool around with other programs.

But it's a good bet that no complications will arise, and the spot you want will be very close to location 165B. When you have entered your new message there, you will have accomplished a minor reprogramming of Z-BASIC—call it a customization. You don't have to know anything about machine language or assembly language to do this sort of thing. But you do have to be *very* careful.

I make it a practice to keep a hard copy of the hex portion I'm fooling with *before I make any changes*. It's easy enough to do if you have a printer. Just type CTRL-P whenever you want hard copy—and CTRL-N when you don't want any more. If you don't have a printer, hand copy what you see on the screen so that you can reverse changes if necessary.

Z-BASIC has other messages, of

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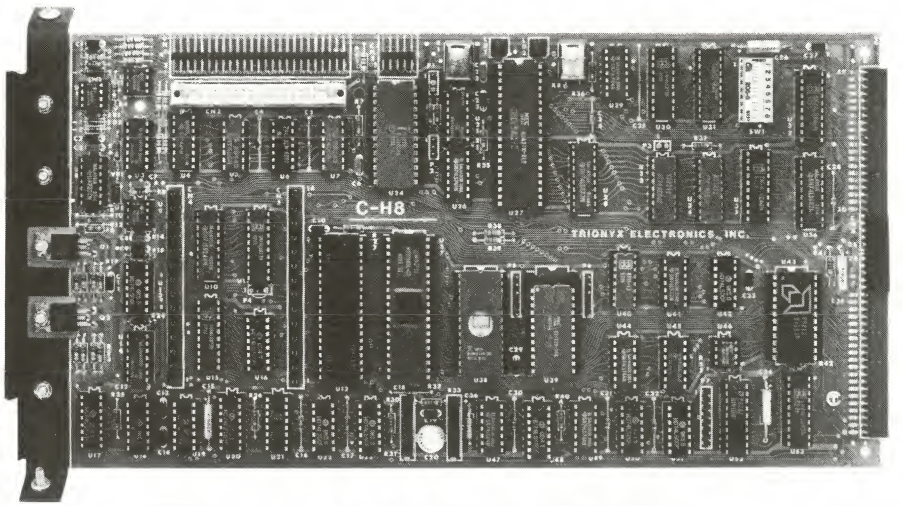

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course. If you find any of them confusing or intimidating, you can search for them and change them.

Reprogramming the function keys

Now for the function keys. Enter DEBUG the same as before by typing:
DEBUG ZBASIC.COM <RETURN>

"LIST" is the command currently set for the first function key. So, let's look for it. At the DEBUG prompt, this time enter:
S0 9000 "LIST" <RETURN>

DEBUG should respond with:
XXXX:843E

The section of code that sets the function keys is 192 bytes long—from address 843E to 84FD. So enter:
D843E 84FF <RETURN>

You should get a display like that in Figure 3. (Again, remember that there will be another column of figures at the far left. You can ignore it.) This gives you the place in ZBASIC.COM that permanently assigns what you get when you press a function key. So, within certain limits, you can now change the keys to do what you want, and they will have the assignments you designate whenever you enter Z-BASIC.

There are a number of limitations:
1. You cannot expand this code as a whole past its current end; other sections of Z-BASIC address preceding and succeeding code. So don't change any code before 843E or after 84FD. (Fooling with code beyond 84FD yields unpredictable results. In one case, Z-BASIC went right into never-never land—where CTRL-RESET was the only way out.)
2. Sixteen addresses are assigned to each function key.
3. You cannot change the sequence of the keys; that is, function key 1 will always address 843E and print the contents of locations from that address forward. F2 will always address 844E, etc. (If you are wondering about function key 0, Z-BASIC does not permit it to be reprogrammed like the other function keys. Somewhere in the bowels of Z-BASIC, F0 is permanently assigned to print CTRL-U, which causes deletion of a line.)
4. A key will print the contents of addresses until the program encounters 00. This means that it is possible to have a key print more than 15 characters if you are willing to give up use of the following key or keys. (But don't overlook the possibility of having one key print a long message or command and the next higher key print only the latter portion of the message or command. For instance, you might have function key 7 print the code to give you a block cursor and key 8 print the code to cause a non-blinking cursor. If you don't include an intervening 00, then hitting F7 will give you a non-blinking block cursor, while F8 will turn on a non-blinking standard cursor. You will no doubt think of other cases where the latter portion can stand on its own. But watch your semicolons and colons—just as you would in any other print command.)

```
843E  4C 49                                                 LI
8440  53 54 20 00 00 00 00 00-00 00 00 00 00 00 52 55   ST ..........RU
8450  4E 0D 00 00 00 00 00 00-00 00 00 00 00 00 4C 4F   N............LO
8460  41 44 22 00 00 00 00 00-00 00 00 00 00 00 53 41   AD".........SA
8470  56 45 22 00 00 00 00 00-00 00 00 00 00 00 43 4F   VE".........CO
8480  4E 54 0D 00 00 00 00 00-00 00 00 00 00 00 50 52   NT..........PR
8490  49 4E 54 20 00 00 00 00-00 00 00 00 00 00 41 55   INT .........AU
84A0  54 4F 20 00 00 00 00 00-00 00 00 00 00 00 46 4F   TO ..........FO
84B0  52 20 00 00 00 00 00 00-00 00 00 00 00 00 4E 45   R ...........NE
84C0  58 54 00 00 00 00 00 00-00 00 00 00 00 00 47 4F   XT..........GO
84D0  53 55 42 00 00 00 00 00-00 00 00 00 00 00 54 52   SUB .........TR
84E0  4F 4E 0D 00 00 00 00 00-00 00 00 00 00 00 54 52   ON..........TR
84F0  44 46 46 0D 00 00 00 00-00 00 00 00 00 00 06 0A   OFF.........
```

Figure 3. DEBUG's display of the contents of ZBASIC.COM from hex address 843E through 84FD. This shows the Z-BASIC commands currently input by the Z100's function keys.

```
 ? sp  C  H  R  $  (  2  7  )  ;  "  p  " cr     ? sp  C  H  R  $

3F 20 43 48 52 24 28 32 37 29 3B 22 70 22 0D 00 3F 20 43 48 52 24

28 32 37 29 3B 22 71 22 0D <RETURN>

 (  2  7  )  ;  "  q  " cr
```

Figure 4. A suggested replacement for one of the strings in Figure 3. The shaded portion shows the ASCII equivalents of the hex numbers to be input.

```
84D0  53 55 42 20 00 00 00 00-00 00 00 00 00 3F 20   SUB .........?
84E0  43 48 52 24 38 32 37 29-3B 22 70 22 0D 00 3F 20   CHR$(27);"p"..?
84F0  43 48 52 24 38 32 37 29-3B 22 71 22 0D 00 06 0A   CHR$(27);"q"....
```

Figure 5. Use DEBUG to display the contents of the addresses after they have been changed. The last three lines of Figure 3 should now look like what is shown here.

Now for an example of how to enter code to have the function keys do whatever you might want them to. Let's suppose that you seldom use trace-on (TRON) and trace-off (TROFF). So you really don't want to waste function keys on them. Instead, you'd like to be able to go into reverse video with F11 and go out of it with F12.

So, let's put CHR$(27);"p" (reverse video) in place of TRON, and CHR$(27);"q" (back to normal) in place of TROFF.

At the DEBUG prompt, type:
E84DE <RETURN>
DEBUG comes back with:
XXXX:84DE 54

Now enter the hex numbers you'll find in Figure 4. Again, press the space bar after each couplet. (And again, stay away from <RETURN> until you have made all entries.)

Check your entries by typing:
D843E 84FF <RETURN>

The last three program lines printed should be as you'll see in the output shown in Figure 5. Check the entries carefully. Make sure that you have entered 0D at the end of each sequence (0D is the code for RETURN, and it must be included here for the print commands to take effect). If all is well, type:
W <RETURN>
And, at the next DEBUG prompt:
Q <RETURN>

Go to Z-BASIC and play around with keys F11 and F12. Be sure to be on a new line when you press either key. If not, you'll get a "Syntax error" just as you would if you tried to print manually on the same line as a previous statement without the proper punctuation.

I'm sure you can readily see the tremendous flexibility you will now have with regard to the function keys. Among numerous other possibilities, don't overlook the many other escape codes in Appendix B of the H/Z100 User's Manual, such as CHR$(27);"L" (insert line), CHR$(27);"t" (the shifted-keypad mode), CHR$(27);"x2" (key click off), etc.

Getting a new entry announcement

So much for the function keys; now on to the messages Z-BASIC gives you when you enter it. If you have my version and 128K of random-access memory (RAM), you will see:

```
Z-BASIC Rev. 1.0
[Z-DOS/MSDOS Version]
Copyright 1982 (C) by Microsoft
Created: 01-Oct-82
47894 Bytes free
```

You can change any of this—except the number of bytes. (But you can skip displaying the number itself, as I will explain further on.) The procedure is

```
8120  0E 02 0A D6 0A CD 8A F1-07 C3 20 42 79 74 65 73   ...V.M.q.C Bytes
8130  20 66 72 65 65 00 5A 2D-42 41 53 49 43 20 52 65    free.Z-BASIC Re
8140  76 2E 20 31 2E 30 0D 0A-5B 5A 2D 44 4F 53 2F 4D   v. i.0..[Z-DOS/M
8150  53 44 4F 53 20 56 65 72-73 69 6F 6E 5D 0D 0A 43   SDOS Version]..C
8160  6F 70 79 72 69 67 68 74-20 31 39 38 32 20 28 43   opyright 1982 (C
8170  29 20 62 79 20 4D 69 63-72 6F 73 6F 66 74 0D 0A   ) by Microsoft..
8180  43 72 65 61 74 65 64 3A-20 30 31 2D 4F 63 74 2D   Created: 01-Oct-
8190  38 32 0D 0A 00 0D 0A 45-72 72 6F 72 20 64 65 74   82.....Error det
```

Figure 6. DEBUG's display of the addresses containing Microsoft's Z-BASIC copyright announcement.

```
0100  44 41 54 45 0D 0A 54 49-4D 45 0D 0A 4D 41 4B 45   DATE..TIME..MAKE
0110  20 53 59 53 43 4F 50 59-2E 44 41 54 0D 0A 45 52    SYSCOPY.DAT..ER
0120  41 53 45 20 42 3A 41 55-54 4F 45 58 45 43 2E 42   ASE B:AUTOEXEC.B
0130  41 54 0D 0A 1A                                    AT...
```

Figure 7. A dump of the AUTOEXEC.BAT **file contained on Z-DOS Distribution Disk 1.**

```
5A 42 41 53 49 43 20 4D 4F 44 45 2E 42 41 53 0D 1A 00 <RETURN>
 Z  B  A  S  I  C sp  M  O  D  E  .  B  A  S cr
```

Figure 8. A suggested replacement for the contents of AUTOEXEC.BAT. **(The ASCII equivalent is shown shaded.)**

```
0100  5A 42 41 53 49 43 20 4D-4F 44 45 2E 42 41 53 0D    ZBASIC MODE.BAS.
0110  1A
```

Figure 9. DEBUG's **dump of the changed** AUTOEXEC.BAT **file.**

similar to what we did with "?Redo from start", but not exactly the same.

Get into the program with DEBUG as you did before. Now type:

S0 9000 "Bytes free" <RETURN>

DEBUG should give you in response:

XXXX:812B

At the prompt, type:

D8120 <RETURN>

You should get a display like that in Figure 6. Notice that the order of the text is partially reversed. It seems that the program jumps about a bit to pick up the number of free bytes then comes back to this segment. In any case, I think you can see the possibilities of making some useful substitutions. Just be sure that you end with 00, whatever you do. (Or you'll have a result you don't want, such as a display of "Error detected at command line".)

As you can see by comparing DEBUG's display with the announcement as it normally appears, hex 0D/0A produces a carriage return/line feed on the screen. You can shift the locations of the the 0D's and 0A's, or delete them altogether if you like. But don't fool with any other places that contain hex numbers that don't print out as text. On the right side of DEBUG's screen display, such characters show up as periods. They represent instructions of one kind or another.

You *can* safely add non-printable characters of your own, however, if you stay within the text area. In particular, here's where you can suppress the printing of the number of bytes available. If you wish to, you can insert hex 15 into position 812A in place of the hex 20 (a space) that you see there. In Z-BASIC, hex 15 is the same as CTRL-U. So it blanks out the line with the number of bytes as soon as the number is printed to the screen. You can follow it with any text you like.

Or, try some of the CHR$(27) sequences I referred to earlier. Look them over in Appendix B of the H/Z100 User's Manual. Within the boundaries I explained, the messages you include or the other sequences you program are up to you.

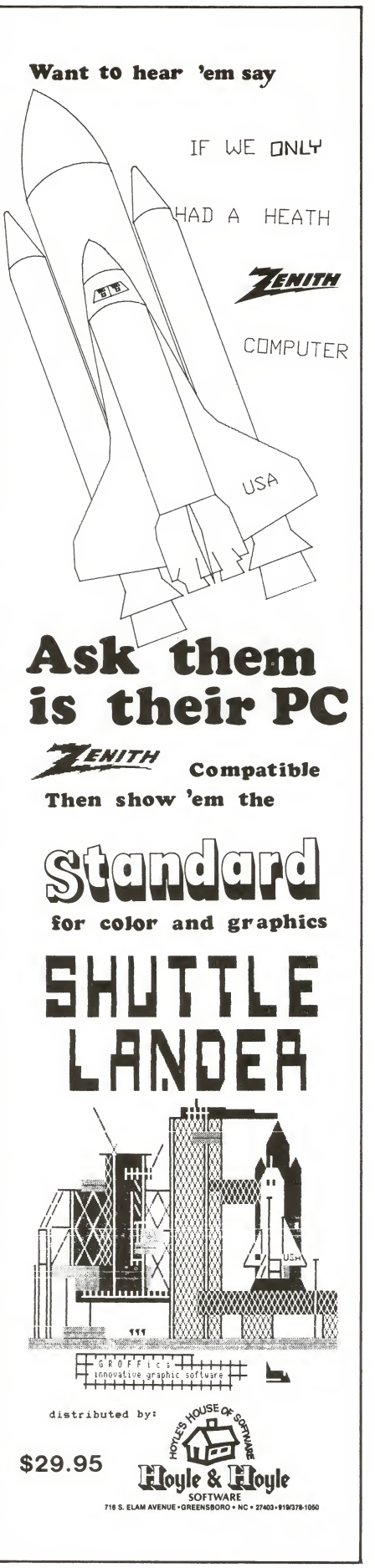
Again, be absolutely sure to keep a copy of the original lines *before you make any changes*. If you don't, I'll guarantee that you'll regret not having spent a few minutes doing so.

Altering AUTOEXEC.BAT

The last procedure I'll describe is altering AUTOEXEC.BAT to go right into Z-BASIC and then automatically run one of your programs.

Let me say at the outset that, in this case, you can just as easily make the changes in AUTOEXEC.BAT with a word processor like WordStar or an editor like EDLIN (the editor that comes with Z-DOS). But let's stay with DEBUG.

There's something you should bear in



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mind as you start to work with AUTOEXEC.BAT. If you plan to run a Z-BASIC program right from a cold start (or RESET) and you want to display messages or reminders, don't have a clear-screen (CLS) in the first line of your program. If you used a CLS, you wouldn't have much of a chance to read whatever message you programmed at the head of Z-BASIC.

At boot-up, Z-DOS looks for AUTOEXEC.BAT on the disk in the default drive. If it finds it, Z-DOS automatically executes programs that it finds listed in AUTOEXEC.BAT. It's a simple matter to alter AUTOEXEC.BAT by putting into it something like: ZBASIC FAVORITE.PGM. In that case, when you turn on or reset the machine, it will load the operating system, then run Z-BASIC and FAVORITE.PGM.

AUTOEXEC.BAT is a short program, so it's easy to locate and change. The first step is to copy it from Z-DOS Distribution Disk 1 to the disk you are working with. When you have done so (and stored away the distribution disk), type:

DEBUG AUTOEXEC.BAT <RETURN>

Then, at the DEBUG prompt, type:

D100 134 <RETURN>

DEBUG will give you the output shown in Figure 7. Take note of the 1A in location 0134. It is the hex number that, in this case, represents the end of AUTOEXEC.BAT. Whatever changes you make, you should have that 1A at the end or you may get unexpected results.

(If there's no 1A to indicate the end of AUTOEXEC.BAT, giving a Z-BASIC "system" command will send execution back into AUTOEXEC.BAT. AUTOEXEC.BAT will re-start at the next location in memory after the last program that was run. It could run into remnants of what had previously been loaded and run by AUTOEXEC.BAT.)

Now let's say you want to have your computer go right into a Z-BASIC program when you boot Z-DOS. For this example, I'll show how you would have a sample program called MODE.BAS run without you having to type anything at all. (The real MODE.BAS happens to be a program I wrote to set printing modes for the Epson FX-80 printer.)

In this case, we are going to delete the DATE and TIME commands. (They could be left in. In that case you would enter the date and time as usual, then the machine would zip right into your Z-BASIC program.)

You're still in DEBUG, so at the prompt type:

E100 <RETURN>

And enter the series of hex numbers given in Figure 8. Do it the same way as in the earlier examples, not using <RETURN> until you have entered all of them. To check that your entries are correct, type at the DEBUG prompt:

D100 110 <RETURN>

You should see the output shown in Figure 9. If everything is O.K., type:

W <RETURN>

Then:

Q <RETURN>

Of course, you could have put 1A in address 0106 in place of the space (20) and left out MODE.BAS. Then Z-DOS would take you into Z-BASIC and stop there. There are countless possible ways to usefully program the file you'll call from AUTOEXEC.BAT. You could have any program, long or short, to do almost anything you want.

For example, write the following short program and save it as MODE.BAS in Z-BASIC:

```
10 PRINT CHR$(27);"p";
20 PRINT "now is the time"
30 PRINT CHR$(27);"q"
40 PRINT "now is the time"
50 PRINT CHR$(27);"F";
60 PRINT "the quick brown fox"
70 PRINT CHR$(27);"G";
80 PRINT "the quick brown fox"
```

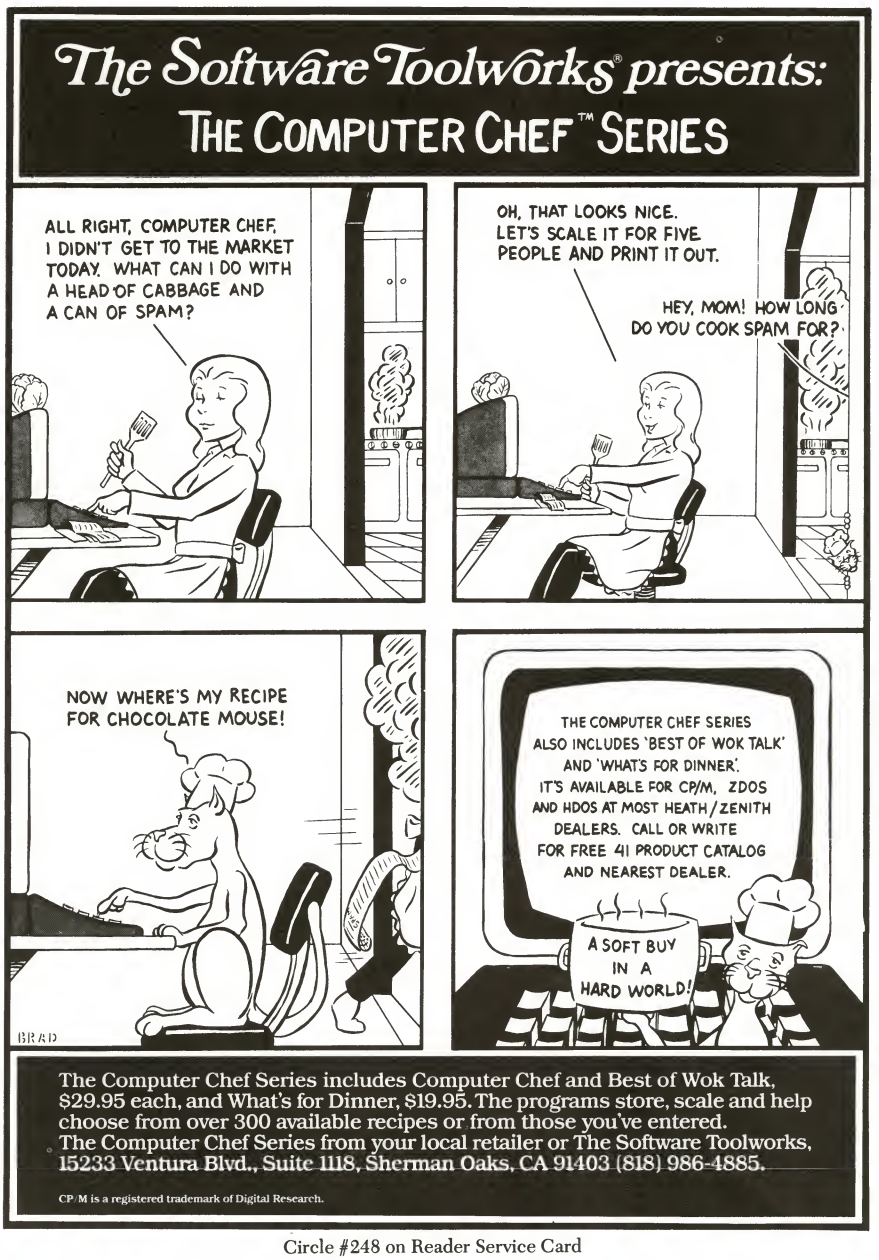
Now reset and observe the results. I think you'll appreciate the kinds of things you can include to set up the H/Z100, printer, modem, etc.

Anything else?

I didn't want to cloud things by going into how to modify other programs—such as WordStar, for example. But if you think about it, you can apply much of the foregoing to other programs you use regularly. If one of them has a confusing error message, for instance, or a menu that you don't like, you can use DEBUG to go in and change it. (Once again, though, caution is essential.)

A final note—if it hasn't occurred to you already, consider this: you can now easily customize a program like Z-BASIC several different ways to meet different needs you may have when working with particular disks.

There's really no end to the possibilities, and it's enjoyable, useful, and instructive to explore them.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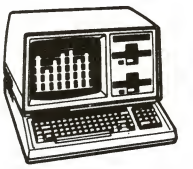

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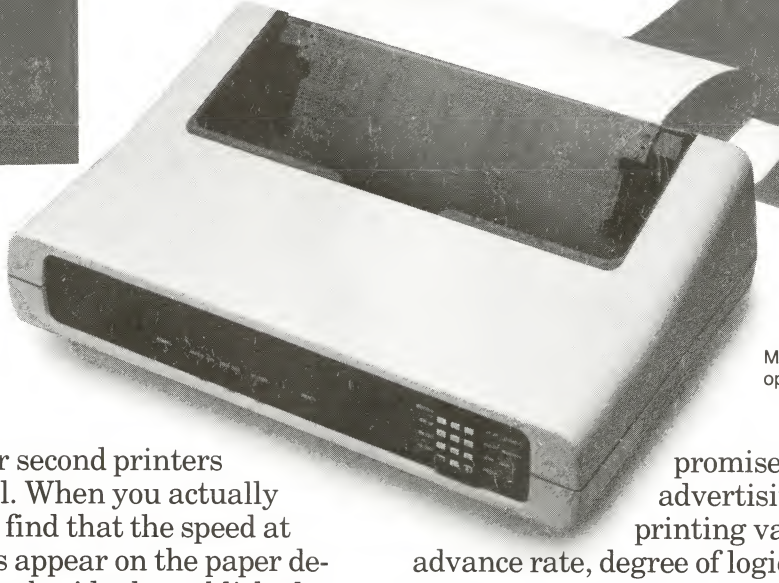
Epson FX-80	82 cps	80 cps	55 cps	160 cps
Star Gemini	63 cps	77 cps	76 cps	100 cps
Okidata 84	126 cps	204 cps	100 cps	200 cps
Zenith 99	55 cps	58 cps	58 cps	100 cps
Zenith 150	113 cps	166 cps	142 cps	150 cps
"S" printer	106 cps	113 cps	111 cps	160 cps



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And if file access may not be instantaneous, there is hardly enough difference to notice.

The Trionyx product to do this is their Mass Memory System. It is RAM that can appear to the central-processor unit (CPU) as if it were a disk. You can call it whatever you prefer: a disk emulator, a RAM drive, or a RAM disk. Whatever you call it, you can use it as RAM. And you can use it as a disk drive. Of course, the storage lasts only so long as the computer is on. (A battery backup can change that.) But the access to disk files is faster than with any disk drive available.

The Mass Memory System is a three-board electronic disk emulator. It comes supplied with software to run under CP/M or the Heath Disk Operating System (HDOS). I bought a Mass Memory System to use in my H8 and have been favorably impressed with its speed and operation from both a hardware and a software standpoint.

If you have ever had the pleasure of handling a Trionyx printed-circuit (PC) board, you know how beautiful the artwork and quality of materials are on all their boards.

I bought the system to improve my H8's performance in handling text files. This it now does very well, as you can see in Table 1.

By the way, if you're considering adding an electronic disk to your H8, the main competition is also a Trionyx product. That is the X/2 bank-select card. It was reviewed in *Sextant* #10, May-June 1984, by Thomas R. Sear ("Put an Electronic Disk into Your H8"). And if you are thinking about upgrading your H8, you may want to consider the X/2 as well as the Mass Memory System.

While both products can function as disk emulators, there are significant differences between them. For instance, the bank-select card is limited to a maximum of 192K of additional memory in the H8. The Mass Memory System, however, can have 1,024K in the H8 box—and ultimately 4,096K with an expansion box.

Another major difference is cost. The Mass Memory System costs $530 kit, $645 assembled (plus the cost of RAM chips). That includes one memory board for up to 512K. The bank-select half card costs just $175 in kit form, $225 assembled (plus chips). The X/2 allows you to use old memory cards such as 8K or 16K Heath boards. This would make a very cost effective, but limited, electronic disk emulator. If you happen to have some old Heath memory boards lying around, then, you might consider the X/2 card over the Mass Memory System. But remember the *size* of the Mass Memory System versus the X/2 card. If it is megabytes you need, the Mass Memory System clearly gives you more.

Software

I just received the CP/M software to try out, and it works flawlessly; in fact, I am using the Mass Memory System to create this text file. I use the Magic Wand word processor under CP/M. It is not very fast when loading a file off disk. But when using it with the Mass Memory System, I can create files pronto!

Before I had a chance to try out the Mass Memory System, there was some concern about operating it with my particular system. Bill Perry, the president of Trionyx, was concerned because I am using ZCPR—a CP/M system enhancement—and BIOS80—a Livingston Logic Labs version of CP/M's Basic

Times for HDOS files

Operation	Floppy disk	Mass Memory System
To boot HDOS 2.0	19.4	1.9
To load MBASIC	5.3	.8
To load B.H. BASIC	5.2	.5
To load EDIT19	11.4	1.7
To load TxtPro	4.0	.8
To load a sample BASIC program	3.9	.9

Times for CP/M files

Operation	Floppy disk	Mass Memory System
To run FBAD	63.0	18.2
To load Magic Wand using FBAD	16.2	3.9
To assemble a source file (74K) using MAC	124.0	61.0
To LOAD the same file	16.3	1.8
To load MBASIC	10.8	.8

Table 1. Speed comparisons between a floppy-disk drive and the Mass Memory System. Times are given in seconds.

Input/Output System (BIOS).

Having system enhancements, etc., was cause for concern because of the principles on which CP/M was designed. The problem can be seen in the way CP/M handles peripherals, etc. With HDOS, new devices (printers, disk drives, etc.) can simply be "tacked on" with device-driver programs. You can write drivers for any number of devices, and they remain separate. You only have to worry about the particular device you are writing for at the time.

With CP/M, though, the code to handle a device is actually incorporated into CP/M's BIOS. It actually modifies the BIOS. So the code someone writes for one device might conflict with that which is put in for another. The more you add, the greater the likelihood of conflict. With two system modifications, then, and their new Mass Memory System, Trionyx was worried that the odds might catch up with me.

It's nice to have a supplier warn you of problems that *might* happen. But fortunately, there was no need to worry. I installed the CP/M software using the documentation supplied with the Mass Memory System. And within 15 minutes, I was PIPing files to the Mass Memory System with no problems.

The first use of the Mass Memory System is quite an experience, to say the least! You feel as if you have unleashed a super computer inside your H8 mainframe, with unlimited power. In reality, you have just sped up all disk I/O by about 10 times, which is a considerable amount. The CP/M software (written by J. J. Thompson) is superb in its ease of installation and operation.

To use the Mass Memory System, you must first create a bootable CP/M disk. This system disk has to be for a 63K system, however, which is not standard.

I have created a sample procedure for this, shown in Listing 1.

After setting up your system disk, you must do a cold boot to use the 63K boot disk you just created. Now you can PIP the MM.SYS, MM.COM, and MM.DOC files to the boot disk.

And *please* read the DOC file before attempting to use the MM.COM file.

```
A>FORMAT (a blank disk to create the 63K disk on)

A>SYSGEN
  SYSGEN VER. 2.0.03
  SOURCE DRIVE NAME (OR RETURN TO SKIP):A (use boot disk)
  SOURCE ON A, THEN TYPE RETURN
  COPY BIOS.SYS (Y/N):Y
  FUNCTION COMPLETE
  DESTINATION DRIVE NAME (OR RETURN TO REBOOT):A (replace disk)
  DESTINATION ON A, THEN TYPE RETURN
  FUNCTION COMPLETE
  DESTINATION DRIVE NAME (OR RETURN TO REBOOT): hit <RETURN>

A>
PIP these files to your new disk:
MOVCPM.COM, SYSGEN.COM, PIP.COM, CONFIGUR.COM, and STAT.COM

A>MOVCPM 63
  CONSTRUCTING 63K CP/M vers. 2.2
  READY FOR "SYSGEN" OR
  "SAVE 38 CPM63.COM"

A>SYSGEN
  SYSGEN VER. 2.0.03
  SOURCE DRIVE NAME (OR RETURN TO SKIP):<RETURN>
  DESTINATION DRIVE NAME (OR RETURN TO REBOOT):A
  DESTINATION ON A, THEN TYPE RETURN <RETURN>
  FUNCTION COMPLETE
  DESTINATION DRIVE NAME (OR RETURN TO REBOOT):RESET system
```

Listing 1. A screen display of the steps involved in creating a 63K system disk by means of SYSGEN and MOVCPM63. Appropriate responses are shown underscored.

I know how excited we get when we have a new toy to try out. And I know how the manual or documentation gets thrown under the packing material until we find out something doesn't work (or until we find out we fouled it up). Then, and only then, should we read the documentation, right? Well, I have done this and been sorry for it. So by all means: *read the DOC files!*

Trionyx is now working on a BIOS modification for the Mass Memory System. So creating a 63K CP/M disk will not be necessary. At present, however, the Mass Memory System and the bank-select card have device drivers that need to relocate themselves above the BIOS. Only one or the other will work with CP/M, because trying to load in two device drivers above the BIOS could be catastrophic.

The HDOS software is also superb in its ease of installation and use. The diagnostics to test the Mass Memory System are supplied in HDOS format. The HDOS software was written by Al Dallas (Software Magic) and Dean Gibson (UltiMeth Corp.). As far as I know, the Mass Memory System and the X/2 bank-select card will work together if you are running HDOS because of the way that HDOS handles device drivers.

Hardware

The Mass Memory System is composed of three boards that go in the H8. The first board is the controller board. It uses an external mini bus board on the left side of the computer to communicate with the memory board(s). (Trionyx reports that they will be offering an expansion chassis. Using this, you will be able to connect eight additional memory

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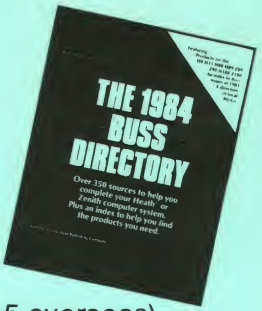
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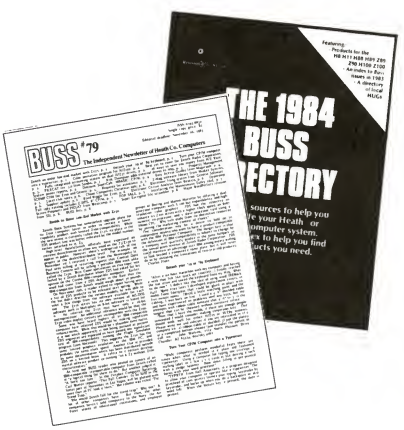

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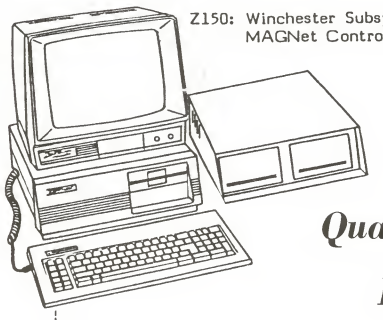

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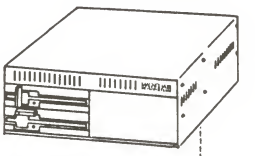

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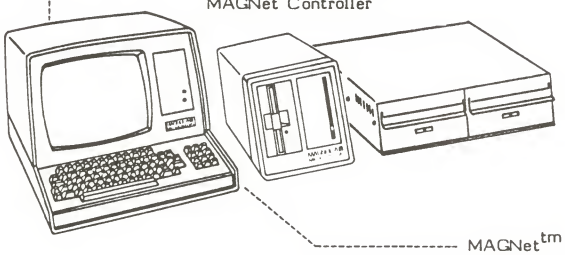

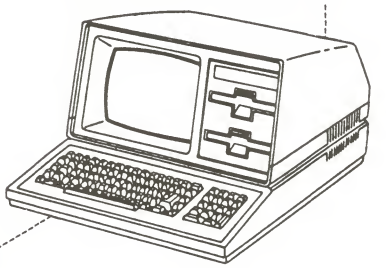

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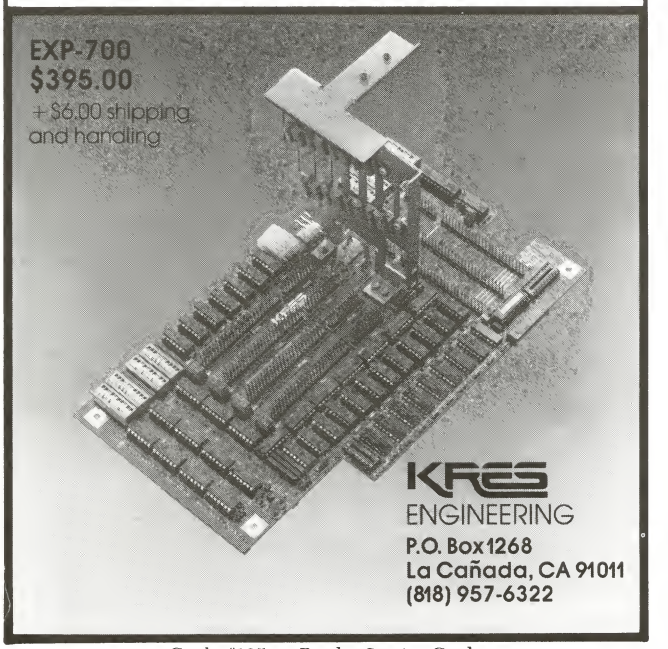

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boards to the controller, for a total of five megabytes.)

The memory boards can be set up to use either 16-kilobit or 64-kilobit RAM chips; you can use either kind by jumpering pin strips on the memory boards and controller board. Using the full complement of 16-kilobit RAM chips (64 of them) will give you 128K per board. But using 64-kilobit chips will give you 512K per board!

The controller board has three light-emitting diodes (LEDs) on the top edge. They indicate whether you are accessing the Mass Memory System, whether you have a parity failure on one of the rows of chips, and whether the power has failed. (True, you don't need an LED to tell you *that*: the absence of any light at all would tell you about power failures. Actually, the power-fail LED is meant for the battery backup. This has not been implemented yet.)

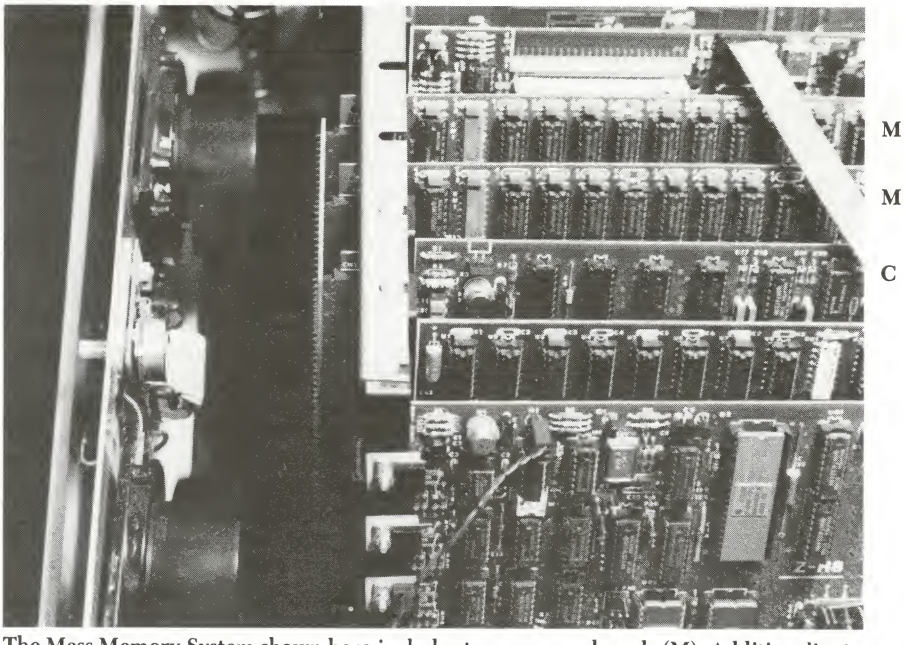


Photo by Robert Hinnard.

The Mass Memory System shown here includes two memory boards (M). Additionally, it uses a mini bus on the left side of the computer to allow the memory boards to communicate with the controller board (C) in front of them.

Tracking down bad chips

The memory boards have room for parity chips that will check for parity errors to be indicated by the LED.

As an aside for those who may not be familiar with parity error checking, it is one of those things on which experts disagree. Some like it, some don't.

Basically, parity checks the accuracy of values stored in RAM during program execution. Parity takes the 8-bit byte to be stored and uses a formula to derive a 1-bit value for the number. The parity bit, then, is a ninth bit to be stored away in another chip. ("Even" and "odd" parity are the two types of parity. Where one would produce a "zero" parity bit, the other would produce a "one.") When the 8-bit number is next read from storage, the computer checks to make sure it still produces a one or zero parity value.

It's not as simple as the 8-bit number's being either odd or even. If that were the case, then only the last digit of the eight bits would count. Rather, if *any* of the eight bits changes, it will reverse the parity value.

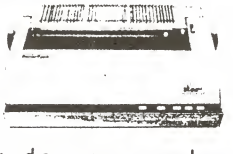
True, it is possible that two bits could change. Effectively, one change would cancel out the other. Then the parity value would be the same as before. Parity operates on the assumption that this is statistically unlikely. Most of the time, only one bit in a byte will change.

In any event, every time the computer reads the value, it also checks the parity value. The parity bit and the main value should still "match." If they do not, then an error has taken place.

Of course, it could be an error in the parity chip! Which is one reason why some folks don't care for parity. They assume the parity chips have just as much chance of error as the rest of RAM. And since parity is an extra bit, you need extra chips to store it in: 12.5% more storage than you would need without parity. Moreover, parity is only an error *detection* technique. It can't correct errors.

On the other hand, parity is there all the time. It is a sort of "distant early warning" system to warn you of a problem without your having to watch programs crash, and without having to run a memory-test program. Personally, I use parity error checking. Having provisions for it was another argument in favor of purchasing the Mass Memory System. But if you do not use parity, you do not have to fill those chip sockets.

Working with parity under the Mass



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Memory System is relatively straightforward. If a parity error occurs, information on it is available at port 04H. You can read that port and find out which row of chips the error was on.

To read the parity address, you must enter port 04H's address through the front panel of the H8 and read the data at that port.

When you check the port by the steps below, you will receive only one row address. The Mass Memory System controller board has a single latch that goes high when a parity failure occurs. So if you had two or more parity failures on the Mass Memory System, you would get the row address of only the first chip that failed. The assumption is that errors from other chips will show up later on their own.

I use the Trionyx FWZ80 front-panel firmware, by the way. This replaces the PAM8 read-only memory on the central-processor board—and comes with new keycaps for the keypad. In the steps below, the labels and input for the original keypad are indicated after the dash.

1) RESET the system.
2) Hit the MEM—or # key.
3) Enter "00 04" hexadecimal—or "000 004" octal.
4) Press the (PORT) IN—or IN key.
5) Read the data in the leftmost set of digits. This is the row where parity has failed. (The row address is coded and Trionyx supplies information to find out which row is being specified.)
6) Press the MEM—or # key.
7) Enter "00 04" hex—or "000 004" octal.
8) Press the OUT key.

Steps 7 and 8 clear the parity-failure detection circuit. The system is ready to run again. It is important that you use steps 7 and 8 to clear all parity errors and data in port 04H before you run the system again. Parity will not be able to report on any other rows until the previous error is cleared out.

A Word on Chips

In putting in the Mass Memory System, I found that I had a problem with some 64-kilobit RAM chips that I had bought in April 1983. They would not pass all bit patterns of the Mass Memory System's HDOS memory tests. I had some Toshiba brand and some Hitachi brand chips, all 150-nanosecond. The Hitachi chips failed in certain locations, while the Toshiba chips did not fail.

I called the company that I bought the Hitachi chips from, not knowing what to expect after having the chips for a year. But they stood behind the chips 100%. They sent new chips to replace the bad ones and even shipped them Federal Express next-day service at no cost to me! This company is Microprocessors Unlimited. (Route 1 Box 260, Beggs, OK 74421, 918/267-4961)

Speed

Using the 64-kilobit RAM chips in my Mass Memory System gives me 1 megabyte of super fast disk storage. To find out how fast the Mass Memory System really is, I ran some simple time tests: loading files from a 5¼" floppy disk and the same files from the Mass Memory System. The results are shown in Table 1.

As you can see, the time is cut dramatically from the floppy disk. Smaller programs are on the screen as fast as I can lift my finger from the return key!

(If you wish to make comparisons with your own system, I should note that my H8 is running at 4 megahertz with 0 wait states; and my disk drives are Tandons with track step times of six milliseconds.)

Et cetera

As noted above, the total cost of this Mass Memory System (all three boards) is $490 kit or $645 assembled. Those prices *do not* include memory chips. But at the time I built these memory boards, 150-nanosecond 64-kilobit RAM chips were less than $5 each. So if you go for the maximum (one megabyte), the cost of chips will add on another $600 or so to the total cost. (If that seems high, it might be well to remember that there was a time when $300 was considered a good price for just 16K!)

One last addition needed for this Mass Memory is battery backup so you can have files on it all the time and not worry about power failures. The last time I spoke with Trionyx, they said that they are going to recommend a battery backup system for the Mass Memory System, but would not be producing one of their own.

Some comments

Trionyx is planning long-term support for the H8 computer. That is particularly good news since Heath is no longer selling the H8 nor offering new products for it.

Trionyx has supplied the H8 community with high-quality boards and software for several years now. Their latest move is to develop an H8-compatible computer called the Trionyx 8/16—which offers both 8- and 16-bit operation. The 16-bit processor board will be based on Intel's 8086 and 8088 (IBM-type) chips.

Personally, I would like to have seen a different chip chosen. But irrespective of the chip, the IBM-compatibility "syndrome" has me concerned. Everyone is following the leader, which

YES WE WILL

Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes

Save your nickels and save your stamps. This is in response to all who have questioned and all who will question whether WE will attend the WESTERN REGIONAL HUGCON in November at Disneyland. We WILL be there, just look for the big crowd with gapping mouths. We will sport both the Z-100 and Z-150, with supplies and stuff for demo and sale.

There should be a chance to meet some of our development people, because we have instigated a company holiday for the event. On all company holidays, we unlock the Development Dungeon and release personnel for food, shower and restroom privileges. Talk about dedication!

The name of the Z-FIVE contest WINNER will be known then. Most likely, ZEGOR will prevail as the master of Z-FIVE, not that he cheats when he plays, but his thinking is based on the latest artificial intelligence programming concepts. I don't doubt it. I can win an average of 3 out of 10 times I play, and then I have to sneak up on him! I'm just glad he can't laugh--yet. I am still the San Diego Scientific resident Z-FIVE King!! At least at the present time. You see, I'm the only person with a copy. All salary raises are based on how many times they (personnel) beat me. Each game they win can merit a 5% raise. So I have to stay sharp. Now that ZEGOR has been turned loose on the public, I'll have to find some other method, perhaps Sumo wrestling.

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should not be IBM! At least not in the micro market. Heathkit had micros (the H8 and H11) long before IBM thought about it.

One very important consideration in favor of IBM compatibility, however, is software support. Among computers with 8-bit processors, 8080/Z80-based micros (such as the H8 and H/Z89 computers) can run CP/M. That gives them the largest software base for any computers available. But for 16-bit operation, the software is being written for the IBM machines and for computers which, like the IBM, are based on the 8086 or 8088 chip.

There is, however, a great deal of hidden software support in the micro market. You only need to think of hobbyist programmers who write programs for their own use—not knowing there may be a market for what they have written. Could that support be tapped? I don't know. But we hobby computerists are a rare breed indeed. "If it works, don't mess with it" is not the motto of this elite group. Rather, "if it works, make it work better or faster" is more like it. We don't look at our computers and see a toaster or waffle iron type of appliance sitting there, but a wonderful little machine that we built—and can improve. (If you're an H8 user out there and haven't taken it apart a few times, shame on you!)

A lot of that spirit seems to be at work at Trionyx. Nonetheless, it would take a brave and well funded company to break the IBM mold and carry on the high-tech products for our bus-oriented micros. Trionyx may not be able to buck the tide. Which is no real criticism, since far larger companies seem unable to do so.

But I do know that Trionyx Electronics is a first-class operation. And they produce the finest quality products and support available for the H8 computer. The Mass Memory System is just the latest example. We can look for still more.

Ordering Information

Mass Memory System:
MC-H8 Memory Controller, kit, $250; assembled, $300.
MM-H8 Memory Board, kit, $250 each; assembled, $300.
MM-BB Bus Board, kit, $30; assembled, $45.
(Memory chips are purchased separately.)
Trionyx Electronics, Inc.
P.O. Box 5131
Santa Ana, CA 92704
714/830-2092

This is an H8?

The picture of the H8 with this article may have all you H8 owners puzzled a bit. Yes, this is my H8. I have added two fans inside the cabinet. I have also changed the metal cabinet it is housed in from the table up.

The new cabinet is made from aluminum sheet and solid bar stock. The outside has been painted to match the colors used on the H/Z110 and '120, which also happen to be the colors of the H29 terminal I use.

In its new case, the H8's familiar front panel disappears. With its keypad and display, it goes behind a new front panel. The new panel is removable for troubleshooting (as shown here). It has just two pushbuttons visible: one for booting the system, and one for resetting it.

I can get away with the "blind" front panel quite easily because I use CP/M almost exclusively. I seldom make use of the front panel as Heath provided it. And with ORG-0 circuitry in the H8, the PAM8 monitor is disabled under CP/M anyway. The front panel is dark and the keypad is inoperative.

I have two fans in the left side of the cabinet. They pull air up from under the H8 through a filter. Then they disperse air over all the boards and heat sinks. Air exhausts through slots cut in the top and bottom of the right side.

This is very effective and very quiet because I am using a fan-control board that Trionyx Electronics has produced. This little PC board, mounted between the two fans, allows me to speed up or slow down the fans.

Obviously, the design of my cabinet has not been tested or approved by the Federal Communications Commission. But the new cabinet is all aluminum. So I believe there is probably much less radio-frequency interference (RFI) than with the original H8 box. (The H8 came out before the regulations did, anyway.)

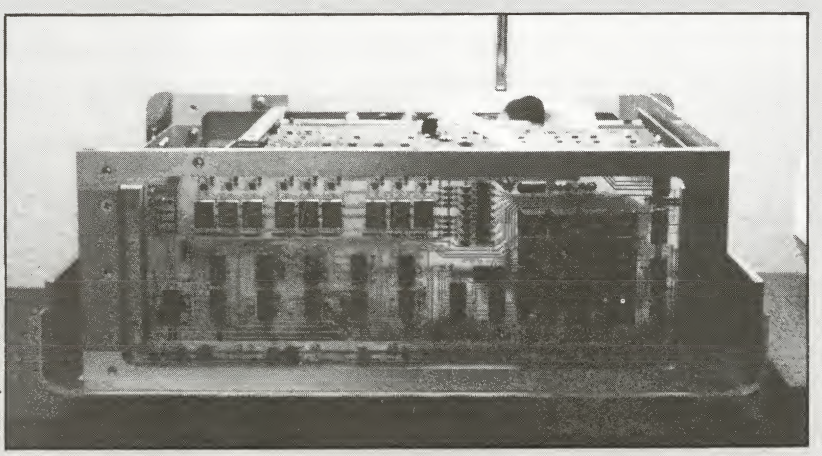

Photo by Robert Hinnard.

The author's design for a new housing surrounds the H8 with a frame over which a streamlined case is placed. As can be seen here, however, that shell can be removed to allow access to the circuit boards. A new front panel would also cover the keypad and display.

In building the new cabinet, I used all of the original H8 parts including the power supply and back-panel switches. I made a port area recessed into the H8 box, so that the cables don't stick out too far behind the cabinet. This port recess has slots for six DB25-type connectors, which is standard for all RS-232 plugs.

I also made provisions for my disk-drive cable to plug into the back panel, instead of having the cable tug on the disk controller every time you move the H8 box around.

And that's an H17?

I have also made a matching cabinet for my disk drives, using the H17 power supply and switches.

The disk drive box has three 5¼" drives. I would like to use half-height drives which would allow me to have 6 drives in one cabinet. This means the disk drive cabinet would need forced air cooling just like the H8.

The cabinet has plenty of room for a hard-disk controller to go inside, such as the Xebec hard disk controller.

If anyone is interested in one of these boxes for their H8 or H17, please let me know. I can try to work out a price for a kit. In quantities large enough to justify setup and tooling, I think they might sell for around $300 each.

I would also consider making these cabinets available for sale to interested persons. Just let me know.

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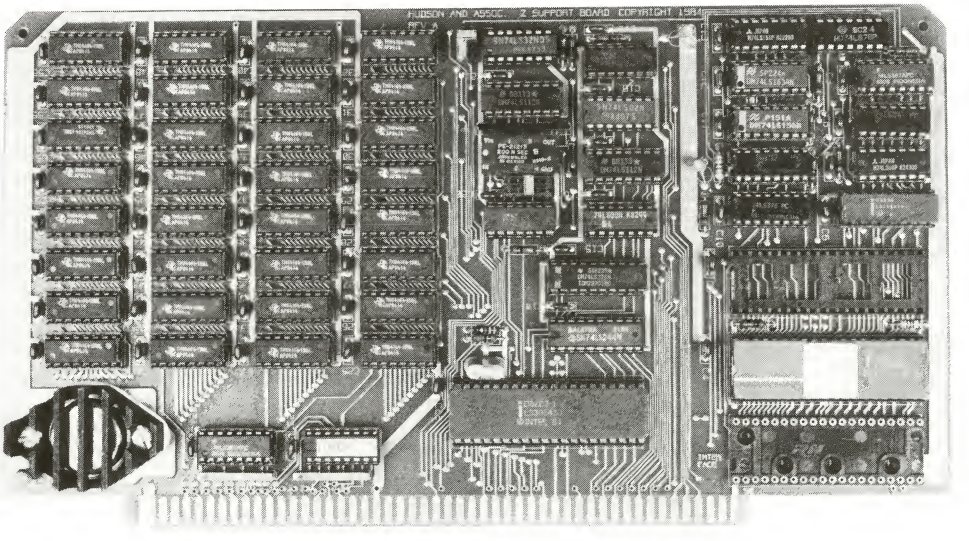

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Screen Out Improper Input

This MBASIC routine will help keep inappropriate data out of your programs.

Kurt Albrecht

Recently, I had the opportunity to write several business-oriented programs. The business environment is a harsh one, and there's little tolerance for errors. Unfortunately, a large number of errors can slip in when using a computer for data-entry work.

To curb that problem, I wrote the protected-input routine presented here. (See Listing 1, INPUT.BAS.) This is written in Microsoft BASIC under the Heath Disk Operating System (HDOS). It has been designed as a small subroutine that can easily be incorporated into a larger program of your own choosing. That might be a mailing list program, for instance, or a data base manager—anything that requires the user to repeatedly input data in a set format. As it stands in Listing 1, it governs data entry into a single field. For a package with a number of data fields, this routine can be used in your program as many times as necessary.

As the user types in data, the INPUT.BAS routine screens out unwanted characters and makes sure that the entry does not exceed a prescribed length. Unwanted and excess characters are simply ignored.

Having a routine like this makes creating a data-entry section of code a joy for programmers. You can then concentrate on the main objective of your programs without worrying about protecting against bad user input. And it's also helpful for the users, who won't have to worry so much about fumble-fingers typing, or constantly re-entering a long series of data due to a "Bad input, please try again" message.

This routine can screen for alphabetical, single-keystroke, integer, and floating- or fixed-point decimal input. It can also force the input to uppercase or lowercase; it can allow for negative values; it can line up decimal points; it can provide a default value for a data field; it can do right and left justification of the input; and it makes the correction of data much easier. Best of all, it does all this in less than two kilobytes!

The routine is very easy to interface with a program. The program assigns values to several key variables. (See Table 1.) These variables detail the restrictions to be imposed upon the input. A GOSUB from your program to the routine then obtains the user's input (A$), after which normal program execution resumes.

In Listing 1, INPUT.BAS has been incorporated into an example program. Lines 10 and 20 and lines 200-560 are INPUT.BAS. Lines 30-190 simply give you a menu noting the options available. You then set them according to the description below. In actual use, of course, your larger program would set these and then GOSUB to the routine. (This particular program doesn't actually do anything; its only purpose is to demonstrate the INPUT.BAS routine. So after you've filled in the data in the field, your entry will be stored in A$ and the program will end.)

Data types

The most important variables are the data types. Within the primary data types (PD%), there are secondary and third data types (SD% and TD%). These define the input restrictions.

The value of PD% determines the nature of the input, chosen from four primary data types: either alphabetical, single keystroke, integer, or decimal.

I'll explain the primary types of input and the variables each uses.

1. *Alphabetical*

This permits alphabetical characters (including a space) to be input.
Secondary data type:
0. Allow only alphabetical characters.
1. Allow alphabetical and numeric characters.
2. Allow alphabetical and special characters.
3. Allow alphabetical, numeric, and special characters.

Third data type:
0. Leave input in present case.
1. Force all lowercase input to uppercase.
2. Force all uppercase input to lowercase.

2. *Single keystroke*

This permits users to select one of several choices by pressing the first character of their choice. (E.g., press "Y" for "Yes.") The choices are defined in the variable DF$, and each is followed by a reverse slash (\), the terminating character. (To change the terminating character, edit line 350.)

For example, if the choice were yes or no, you would set DF$ equal to "Yes\No\".

To aid the user, the programmer may display a message detailing the choices available. The message is defined in the variable MSG$, and will be centered on the twenty-fifth line in reverse video. Obviously, the message must be eighty characters or less.

For example: MSG$="Please press either <Y>es or <N>o."

(Note that the use of angle brackets is just to identify for the user which keys to press and is not significant.)

3. *Integer*

This permits only integer values to be input.
Secondary data type:
0. Value must be positive.
1. Value may be negative.

4. *Decimal*

This permits decimal values to be input.
Secondary data type:
0. Value must be positive.
1. Value may be negative.

Third data type:
0. Floating decimal point used.
#. Number of fixed decimal places.

As with MBASIC's PRINT USING function, the fixed-decimal mode automatically adds a decimal point and zeros to the input value if need be. For this reason, whole-number input is not allowed to extend into the space reserved for the decimal point and decimal value.

Note that unless you explicitly state

Programmer-defined variables:

A$	Input
DF$	Default value
MSG$	Message
LN%	Length of the input field
CF%	Correction flag
JF%	Justification flag
PD%	Primary data type
SD%	Secondary data type
TD%	Third data type

Less important variables:

E$	Escape
BM$	Begin twenty-fifth line message
EM$	End twenty-fifth line message
C$	Single character input
I%	Scratch variable

Table 1: Variables used with INPUT.BAS.

otherwise, the secondary and third data-type variables above will have the default value of zero.

Other options

To let users know how many characters they may enter, a small rectangular box (the input field) is displayed on the screen. As each acceptable character is typed, it appears in the input field. The length of the input field is defined in LN%.

The re-entry of data is made easier by the use of the correction flag (CF%). When set (a value of one), the routine displays the value of A$ and gives the user the option of re-entering the data. (In the demonstration program in Listing 1, the menu will ask you for "Input (If the correction flag is set)." You now have the opportunity to type in something "wrong" so you can correct it almost immediately thereafter. This is just to illustrate INPUT's support of the correction flag.)

The justification flag (JF%) controls the adding of spaces to the input so that the length of the entry is equal to that of the input field (LN%). When JF% equals one, the input is right justified; and when JF% equals two, the input is left justified.

To save user keystrokes, I allow the programmer to include a default value for the user entry into any data field. If the user enters nothing, your default value (DF$) is assumed as the input. If you have not assigned any default value (DF$ is null), a carriage return without prior entry of data will be ignored. (I.e., the user must enter something!)

Control characters

The routine recognizes only a few keyboard control keys. (See Table 2.) All others with an ASCII decimal value less than thirty-two have been disabled.

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```
 05 REM Line 10 -- Initialization
 10 CLEAR 500 : WIDTH 255
 15 REM Line 20 -- Define variables
 20 A$="" : C$="" : DF$="" : MSG$="" : LN%=0 : CF%=0 : JF%=0 : PD%=0 : SD%=0 :
    TD%=0 : I%=0 : E$=CHR$(27) : BM$=E$+"j"+E$+"y1"+E$+"x1"+E$+"p"+E$+"Y8" :
    EM$=E$+"q"+E$+"k"+CHR$(7)
 25 REM Lines 30-170 -- Demonstrate  INPUT.BAS
 30 PRINT E$"E"
 40 INPUT "Primary data type";PD%
 50 INPUT "Secondary data type";SD%
 60 INPUT "Third data type";TD%
 70 INPUT "Length of input field";LN%
 80 INPUT "Correction flag";CF%
 90 INPUT "Justification flag";JF%
100 LINE INPUT "Input (if the correction flag is set): ";A$
110 LINE INPUT "Default value: ";DF$
120 LINE INPUT "Message (if the primary data type is single keystroke): ";MSG$
130 LINE INPUT "Input field title: ";Z$
140 PRINT E$"E";
150 PRINT Z$ ": ";
160 GOSUB 200
170 END
195 REM Line 200 -- Save cursor position
200 PRINT E$"j";
205 REM Line 210 -- Print initial messages
210 IF CF%=1 THEN PRINT E$"x5" E$"p" A$ E$"q" E$"k" BM$" Press <DELETE> to
    make changes.  Press <RETURN> when the information is correct."EM$;
    ELSE A$="" : PRINT E$"y1" E$"p" STRING$(LN%,32) E$"q" E$"k" E$"y5";
220 IF PD%=2 AND CF%<1 THEN PRINT BM$ CHR$((80-LEN(MSG$))/2+32) MSG$ EM$;
225 REM Line 230 -- Get input
230 C$=INPUT$(1)
235 REM Line 240 -- Control-E?
240 IF C$=CHR$(5) THEN CF%=0 : PRINT E$"E" E$"y1"; : GOTO MENU
245 REM Line 250 -- Single keystroke?
250 IF PD%=2 AND CF%<1 THEN IF C$<" " THEN 230 ELSE 340
255 REM Line 260 -- Control character?
260 ON INSTR(CHR$(8)+CHR$(127)+CHR$(13),C$) GOTO 450,460,480
265 REM Line 270 -- Convert line feed to an at-sign (@)
270 IF C$=CHR$(10) THEN C$=CHR$(64)
275 REM Line 280 -- No further analysis needed, get new input
280 IF LEN(A$)=LN% OR CF%=1 OR C$<" " THEN 230
285 REM Line 290 -- Goto data type
290 ON PD% GOTO 310,,380,380 : STOP
295 REM Line 300 -- Form input
300 A$=A$+C$ : PRINT E$"p" C$ E$"q"; : GOTO 230
305 REM Lines 310-330 -- Alphabetical
310 IF INSTR("!#$%&'()*+,-./:;<=>?[\]^`{|}~"+CHR$(34)+CHR$(64)+CHR$(95),C$)
    AND SD%<2 THEN 230
320 IF INSTR("0123456789",C$) AND (SD%=0 OR SD%=2) THEN 230
330 ON TD% GOSUB 410,430 : GOTO 300
335 REM Lines 340-370 -- Single keystroke
340 GOSUB 410 : MSG$=DF$
350 I%=INSTR(MSG$,"\") : IF I%=0 THEN 230
360 IF LEFT$(MSG$,1)=C$ THEN A$=LEFT$(MSG$,I%-1) : GOTO 550
370 MSG$=MID$(MSG$,I%+1,LEN(MSG$)) : GOTO 350
375 REM Lines 380-400 -- Integer and Decimal
380 IF INSTR("0123456789-.",C$)=0 OR (C$="-" AND (SD%=0 OR A$<>""))
    OR (C$="." AND (PD%=3 OR INSTR(A$,"."))) THEN 230
390 IF INSTR("-.",C$) OR PD%=3 OR TD%=0 THEN 300
400 I%=INSTR(A$,".") : IF (I% AND LEN(A$)=I%+TD%) OR
    (I%=0 AND LN%-LEN(A$)=TD%+1) THEN 230 ELSE 300
405 REM Lines 410-420 -- Forced uppercase
410 IF C$=>"a" AND C$<="z" THEN C$=CHR$(ASC(C$)-32)
420 RETURN
425 REM Lines 430-440 -- Forced lowercase
430 IF C$=>"A" AND C$<="Z" THEN C$=CHR$(ASC(C$)+32)
440 RETURN
445 REM Line 450 -- Backspace
450 IF LEN(A$)=0 OR CF%=1 THEN 230 ELSE A$=LEFT$(A$,LEN(A$)-1) :
    PRINT C$ E$"p " E$"q" C$; : GOTO 230
455 REM Lines 460-470 -- Delete
460 IF CF%=1 THEN CF%=-1
470 PRINT E$"x5" E$"k" E$"K"; : GOTO 200
475 REM Lines 480-560 -- Carriage Return
480 IF A$="" THEN IF DF$="" THEN 230 ELSE A$=DF$ : GOTO 550
490 IF PD%<3 THEN 550
500 IF VAL(A$)=0 THEN A$="0"
510 IF PD%=3 THEN 550
520 I%=INSTR(A$,".")
530 IF TD%=0 AND I% THEN IF VAL(MID$(A$,I%,LEN(A$)))=0 THEN A$=LEFT$(A$,I%-1)
540 IF TD% THEN IF I% THEN A$=A$+STRING$(TD%-(LEN(A$)-I%),48)
    ELSE A$=A$+"."+STRING$(TD%,48)
550 I%=LN%-LEN(A$) : IF I%>0 THEN IF JF%=1 THEN A$=SPACE$(I%)+A$
    ELSE IF JF%=2 THEN A$=A$+SPACE$(I%)
560 CF%=ABS(CF%) : PRINT E$"x5" E$"y1" E$"k" E$"K" A$ : RETURN
```

Listing 1. INPUT.BAS is designed to be incorporated into a larger MBASIC program which requires user input of data. It screens for improper input according to a number of criteria (only alphabetical input accepted, single keystroke, etc.). Only the unshaded portions presented here (lines 10–20 and 195–360) are properly part of INPUT.BAS. The shaded portion (lines 30–170) simply allows demonstrating the routine.

CARRIAGE RETURN	Input completed.
BACKSPACE	Move to the left one space and erase the character.
DELETE	Erase the input field (glorified backspace).
CONTROL-E	Abort the routine.

Table 2: Keyboard-control keys valid for use with INPUT.BAS.

In trying to make my programs as user friendly as possible, I always give the user the option of returning to the main menu at any time. Pressing CTRL-E (exit) causes the routine to abort and branch to a given line number. Edit line 240 to make the routine branch to the appropriate location within your program.

Sometimes it is necessary to enter the at-sign (@) character as input. Unfortunately, MBASIC converts the at-sign to a line-feed character. Therefore, line 270 converts the line-feed character back into an at-sign. Since the line-feed key is disabled by MBASIC, it will not produce at-signs when pressed.

Some cautions, etc.

The variables used by the routine should be defined first, so that they will be at the top of MBASIC's variable lookup table. If they're not, MBASIC's variable lookup time will cause a noticeable delay when the user is typing in data. Therefore, place line 20 near the beginning of your program.

Modify the CLEAR statement in line 10 to suit the memory needs of your program.

Because the routine uses the twenty-fifth line, the value of the WIDTH statement in line 10 must be the same as your HDOS terminal width setting. Otherwise, the twenty-fifth line will not display characters properly.

The INPUT.BAS routine saves the cursor position using the H19 terminal function ESC j. If your program also uses this function, then use caution when implementing the routine.

The routine exits with the cursor off for cosmetic reasons alone.

Though negative values are permitted, the routine does not reserve a blank space for the negative sign, as does MBASIC. Thus, the negative sign will occupy one character position in the input field.

When specifying fixed-decimal input, make sure that the number of fixed decimal places is at least one less than the length of the input field. This is to reserve one character position for the decimal point.

This routine has been designed to screen the errors of the user, not the programmer. Therefore, take care in defining the variables. Equate all unused numeric variables to zero and string variables to null.

In conclusion

You should try to place the routine as close as you can to the beginning of your program. This will reduce MBASIC's GOSUB search time. To reduce the size and execution time of the routine, remove all the unnecessary blank spaces, and use multiple statements per line when possible.

Obviously, the variable names may be changed to better suit your needs. Perhaps it would be better to use less obvious variable names (e.g., Z1$ or Z2%), so as not to conflict with those used by your program.

I tried to write the routine in a clear and straightforward manner. Thus, it should be easy to remove the tests you do not need.

This slick little routine should give your latest software creation the look and feel of a professionally written program. It should minimize the number of careless input errors. And it should also enhance your program with the degree of intelligent user friendliness that new computer users desire. I hope you enjoy using it.

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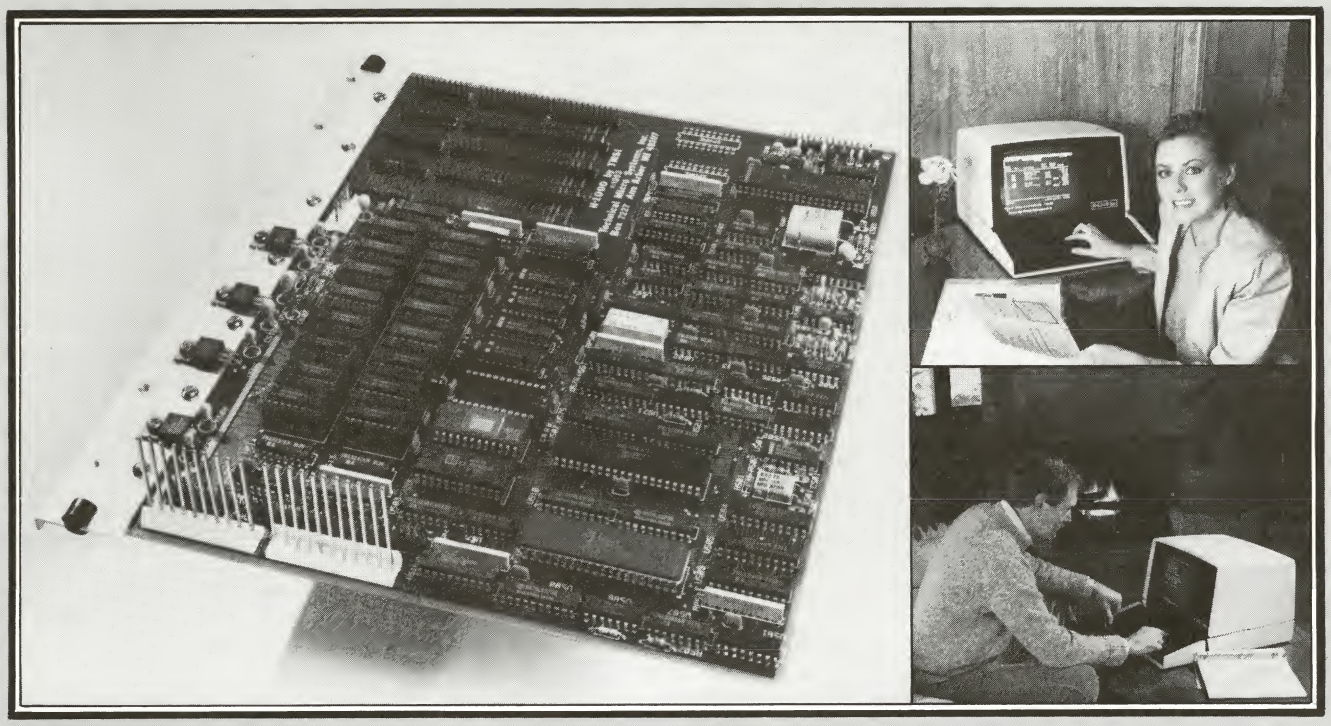

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Moving Your Old CP/M Files to Your New Computer

Now your Z100 doesn't have to use the telephone to communicate with your H8 or '89.

Michael N. Rhoads

If you're the owner of an H8 or H/Z89 computer, and you've just bought an H/Z110 or '120, you've probably still got most of your files on disks meant to be read by the older equipment. How do you get the '100 to get at the files on those disks?

If you use the CP/M operating system, and have 8" disk drives or soft-sectored 5¼" drives with your H8, you've got no problem in getting your two machines to work together. CP/M-85 on your H/Z100 will read the CP/M disks made on your H8 or '89.

Even if you've relied mainly on the Heath Disk Operating System (HDOS), CP/M can serve as your transfer medium. With a program like HOSCOPY from J. J. Thompson, you can copy your HDOS files to CP/M, then go from there.

But if you *don't* have 8" drives on your H8 or '89, and if you *don't* have soft-sectored 5¼" drives, what then? Your '100 disk drives are soft-sectored. Not too many of us bought the 5¼" soft-sectored disk controller board for the H8. '89 owners are somewhat more likely to have soft-sectored 5¼". In any case, if your 5¼" disks are hard sectored, they're useless on the '100.

To get around this, I use the process I'll describe here: basically, making up a connecting cable and using two assembly-language programs, RECD (shown in Listing 1) and TRANS (Listing 2).

In this article, I will describe the method I used to transfer files back and forth between a '100 and my H8 with H17 disk drives. These programs can be used between any two computers that run on CP/M. They will transfer any type of files. (For those of you who wish to go through the programs themselves, they're commented to assist you.)

The method and programs have been tested on H8s, not on an '89. But they ought to work equally well on an '89.

Preparation: a cable change and CONFIGUR

First, you need a cable to go between the H8 and the '100. It will be wired somewhat differently depending on what connector you use. You'll probably want to use the connector you currently use for your printer or modem.

You can check your serial input/output (I/O) board to see whether your present printer or modem is coming from the H8's DCE or DTE connector. If it will be coming from the DCE connector, your cable should be wired straight through: 1 to 1, 2 to 2, 6 to 6, 7 to 7, and 8 to 8. If the H8 end is from the DTE connector, the only difference is that 2 and 3 should be swapped, 2 to 3 and 3 to 2.

Alternatively, you may already have a cable wired up. But it might not be correct for the connector coming out of your computer. If so, you could go inside the computer and move the connector inside to the suitable position. They are labelled for DCE and DTE operation.

In any case, however, there must be a jumper between pins 6 and 8 on the '100 end. (This is required for the '100 and will have no effect on the H8.)

On my H8, I used an H8-4 serial port for the connecting cable. However, any serial board will do. On my '100, I used the AUXiliary port (port B).

I connected my cable to the connector on the H8 serial card and set the jumpers to port 330Q with no interrupt. You will probably want to leave the jumpers set to whatever port number you currently use. I used 330Q, the DTE connector, because this is the same connector I use with the telephone modem. If you are using a modem, you only have to check the port address and make sure the baud rate is the same on both computers; your cable should be O.K. (If you are able to transfer from the H8 to the '100, but not the other way, then check your cable for a jumper between pins 6 and 8.)

With the cable taken care of, there are two methods you can use to transfer files. One just needs PIP, but all it transfers are small ASCII-only files. The other uses my programs RECD and TRANS. With them, you can transfer files of any size, non-ASCII as well as ASCII-only.

CONFIGURing your system

For both methods you may have to CONFIGURe your systems differently from how they are currently set up. So

Listing 1. RECD.ASM will allow a CP/M computer to accept a file from the RDR: device and store it in a user-specified disk and file.

```
;       PROGRAM TO RECEIVE A FILE FROM
;
;       THE RDR: DEVICE AND STORE IT ON DISK
;
;       RECD A:X.Y
;
;       COPIES THE FILE FROM RDR: AND
;
;       STORES IT ON DISK AS X.Y
;
BOOT    EQU     0000H   ;SYSTEM REBOOT
BDOS    EQU     0005H   ;BDOS ENTRY POINT
FCB     EQU     005CH   ;FIRST FILE NAME
DBUFF   EQU     0080H   ;DEFAULT BUFFER
OK      EQU     0001H   ;OK = 1
EOF     EQU     0000H   ;EOF = 0
TPA     EQU     0100H   ;BEGINNING OF TPA
PRINTF  EQU     9       ;PRINT BUFFER FUNC #
CLOSEF  EQU     16      ;CLOSE FILE FUNC #
DELETEF EQU     19      ;DELETE FILE FUNC #
READF   EQU     20      ;SEQUENTIAL FILE READ
```

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```
WRITEF  EQU     21      ;SEQUENTIAL FILE WRITE
MAKEF   EQU     22      ;MAKE FILE FUNC #
PUNF    EQU     4       ;PUNCH FUNC #
RDRF    EQU     3       ;READER FUNC #
        ORG     TPA     ;BEGINING OF TPA
        LXI     H,0     ;CLEAR H&L
        DAD     SP      ;ADD STACK POINTER TO H&L
        SHLD    OLDSP   ;STORE STACK POINTER AT OLDSP
        LXI     SP,STACK;LOCAL STACK
        LXI     D,FCB   ;DESTINATION
        CALL    DELETE  ;REMOVE IF PRESENT
        LXI     D,FCB   ;DESTINATION
        CALL    MAKE    ;CREATE A FILE
        LXI     D,NODIR ;READY MESSAGE
        INR     A       ;255 BECOMES 0
        CZ      FINIS   ;DONE IF NO DIR SPACE
COPY:   CALL    RIN     ;READ A CHARACTER FROM RDR:
        CPI     OK      ;IS IT = OK
        JNZ     EOFILE  ;IF NOT THEN END OF FILE
        MVI     E,OK    ;MOVE OK TO E IF SO
        CALL    WRITP   ;SEND OK
        MVI     D,080H  ;SET COUNTER TO 80
        LXI     H,DBUFF ;LOAD DEFAULT BUFFER
ANOTH:  PUSH    D       ;SAVE D
        PUSH    H       ;SAVE H
        CALL    RIN     ;READ A CHARACTER
        POP     H       ;RESTORE H
        POP     D       ;RESTORE D
        MOV     M,A     ;MOVE CHARACTER TO DEFAULT BUFFER
        INX     H       ;INCREMENT TO NEXT BUFFER LOCATION
        DCR     D       ;SUBTRACT ONE FROM COUNTER
        JNZ     ANOTH   ;IF NOT ZERO THEN DO ANOTHER
        LXI     D,FCB   ;DESTINATION
        CALL    WRITE   ;WRITE RECORD
        LXI     D,SPACE ;READY MESSAGE
        ORA     A       ;00 IF WRITE OK
        CNZ     FINIS   ;END IF SO
        JMP     COPY    ;LOOP UNTIL EOF
EOFILE:                 ;END OF FILE, CLOSE DESTINATION
        LXI     D,FCB   ;DESTINATION
        CALL    CLOSE   ;255 IF ERROR
        LXI     H,WRPROT;READY MESSAGE
        INR     A       ;255 BECOMES 0
        CZ      FINIS   ;SHOULDN'T HAPPEN
        LXI     D,NORMAL;READY MESSAGE
FINIS:
        MVI     C,PRINTF;PRINT MESSAGE
        CALL    BDOS    ;CALL SYSTEM
        LHLD    OLDSP   ;MOVE SP BACK TO H&L
        SPHL            ;SWAP H&L WITH SP
        RET             ;RETURN TO SYSTEM
CLOSE:  MVI     C,CLOSEF
        JMP     BDOS
DELETE: MVI     C,DELETEF
        JMP     BDOS
RIN:    MVI     C,RDRF
        JMP     BDOS
WRITE:  MVI     C,WRITEF
        JMP     BDOS
WRITP:  MVI     C,PUNF
        JMP     BDOS
MAKE:   MVI     C,MAKEF
        JMP     BDOS
NODIR:  DB      'NO DIRECTORY SPACE$'
SPACE:  DB      'OUT OF DATA SPACE$'
WRPROT: DB      'WRITE PROTECTED$'
NORMAL: DB      'COPY COMPLETE$'
OLDSP   DS      2       ;STORE STACK POINTER HERE
        DS      64      ;32 LEVEL STACK
STACK:
        END
```

you may want to set up a separate bootable system disk for the H8 and one for the '100.

For those familiar with CP/M's CONFIGUR program, the setup is given in "A Quick Summary," accompanying this article.

I ran CONFIGUR first on my H8. (Don't forget that immediately after you call for the CONFIGUR program, you may have to hit some spaces to get things going.)

Taking it step by step, I first told CONFIGUR this was *not* to be a standard system. Then under "C. Change the Default I/O Configuration," I set the input ("reader"—RDR:) device to UR1: and the output ("punch"—PUN:) device to UP1:. (This is all documented in the manuals.) Going back to the main menu, I went to "A. Set Terminal and Printer Characteristics." There, I set the devices UR1: and UP1: to 9600 baud and port 330Q. (You would use whatever port number your cable connects to. And if you're going to use the PIP method described below, be sure to set the baud rate to 1200 or lower.) Then the configuration can be saved to disk.

(Remember that only UR1: and UP1: should share a port number. All the rest should have their own—even if you won't be using them. So you may want to switch some other ports so that there's no doubling up.)

For the '100, I ran the CONFIGUR program and selected modem configuration. When asked if this was a standard configuration, I answered no. I could then hit the space bar until I got the baud rate to match that set on the H8. Next, I set 8 bits per character, then no parity, then no handshaking, and finally hit return to go back to the main menu. Then I selected I for I/O map configuration.

There, I chose R for reader and told it I wanted 1 for UR1. This took me back to the I/O menu so I could choose P for punch and tell it I wanted 1 for UP1. This put me back at the I/O menu and I hit X for exit. Then it's X again to exit from the main menu, then P to write the configuration to disk. Then CONFIGUR instructed me to connect my cable to port B on the back of the unit.

Transferring ASCII-only files with PIP

After you have set up the hardware and run CONFIGUR, you can transfer ASCII-only files between the two systems. This can be done using PIP.COM. However, if you attempt to use PIP at baud rates above 1200, something happens in the system and all you get is junk. Therefore, you must keep the baud rate at 1200 or lower.

Moreover, there is no handshaking between the two computers. PIP on the transmitting end will continue to send even while PIP on the receiving end is busy writing to the disk. So all of the characters being transferred while PIP is writing to the disk will be lost. Therefore, only very small files can be transferred.

To transfer ASCII-only files under PIP:

On the receiving end, type:

```
PIP FILENAME.EXT=RDR:
```

(If you get a prompt again, PIP has received an end-of-file and terminated. So do it again.)

On the transmitting end, type:

```
PIP PUN:=FILENAME.EXT
```

(PIP starts transmitting as soon as you hit return; therefore, you must set up the receiver first.)

Patching BIOS85 to transfer non-ASCII files

We can get around the limitations of the PIP method by using TRANS and RECD. But first we should make sure that CP/M on the '100 can handle non-ASCII files.

CP/M's Basic Input/Output System, BIOS85, strips the high bit from all input and output. ASCII characters need only seven bits; therefore the high bit is not used. However, in other types of files (e.g., COM files), all of the bits are used. Therefore, if you want to transfer non-ASCII files, you cannot strip the high bit. This problem is in the '100's BIOS85 and not in the H8. (If you are only transferring ASCII files, the following patch need not be made.)

This patch tells the BIOS not to strip the high bit on input and output. The portion of the BIOS that you are changing can be found in the BIOS85.ASM code on your distribution disk. It is under "BIOS header tables." In my listing, it is on pages 21 and 22. It is four lines under the label TTYTBL, and four

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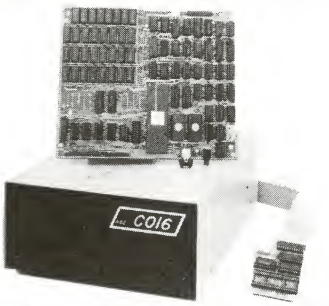

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lines under label ULITBL. CIOSPI (strip parity bit on input) and CIOSPO (strip parity bit on output) can be found under "character I/O table definitions" around page 7.

First remove the read-only flag from BIOS85 by typing:

STAT BIOS85.SYS $R/W

Second, call up DDT in order to patch BIOS85.SYS. Type:

DDT BIOS85.SYS <CR>

(<CR> = RETURN). DDT will give you some numbers and then a "–" prompt. At the – prompt, type in:

S2BF <CR>

It will repeat S2BF and give you an additional two-digit number, x3 (where x = whatever value was there). The value of x varies with the printer configuration. At x3, you type:

x0 <CR>

For example, if you have 13, then change it to 10.

The computer will then type two other numbers; the first will have four digits, the second will have two. At the prompt, you then type . (decimal point) then <CR>. At the next prompt, you type:

S2DF <CR>

At x3, you type:

x0 <CR>

The computer types two other numbers. You then type . <CR> (decimal point, <CR>, again). Then you type G0 <CR> (G zero, <CR>).

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Listing 2. TRANS.ASM will send a file to another computer through the PUN: device.

```
;       PROGRAM TO SEND A FILE TO ANOTHER
;
;       COMPUTER VIA PUN: ON RS-232C
;
;       TRANS X.Y
;
;       COPIES THE FILE NAMED X.Y FROM
;
;       DISK TO DEVICE PUN:
;
BOOT    EQU     0000H   ;SYSTEM REBOOT
BDOS    EQU     0005H   ;BDOS ENTRY POINT
FCB     EQU     005CH   ;FIRST FILE NAME
DBUFF   EQU     0080H   ;DEFAULT BUFFER
OK      EQU     0001H   ;OK = 1
EOF     EQU     0000H   ;END OF FILE = 0
TPA     EQU     0100H   ;BEGINNING OF TPA
PRINTF  EQU     9       ;PRINT BUFFER FUNC #
OPENF   EQU     15      ;OPEN FILE FUNC #
READF   EQU     20      ;SEQUENTIAL FILE READ
PUNF    EQU     4       ;PUNCH FUNC #
RDRF    EQU     3       ;READER FUNC #
        ORG     TPA     ;BEGINING OF TPA
        LXI     H,0     ;CLEAR H AND L
        DAD     SP      ;MOVE THE STACK POINTER TO H & L
        SHLD    OLDSP   ;STORE THE STACK POINTER AT OLDSP
        LXI     SP,STACK;LOCAL STACK
        LXI     D,FCB   ;SOURCE FILE
        CALL    OPEN    ;OPEN THE FILE TO SEND
        LXI     D,NOFILE;READY ERROR MESSAGE
        INR     A       ;255 BECOMES 0 IF NO FILE
        CZ      FINIS   ;DONE IF NO FILE
COPY:   LXI     D,FCB   ;SOURCE
        CALL    READ    ;READ NEXT RECORD
        ORA     A       ;A = 0 IF READ WAS OK
        JNZ     EOFILE  ;JUMP TO END OF FILE IF NOT
        MVI     E,OK    ;LOAD OK IF READ IS OK
        CALL    WRITE   ;SEND OK
        CALL    ACK     ;WAIT TO SEE IF READY TO RECEIVE
        MVI     D,080H  ;SET BIT COUNTER TO 128
        LXI     H,DBUFF ;FIND DEFAULT BUFFER
ANOTH:  PUSH    D       ;SAVE D
        PUSH    H       ;SAVE H
        MOV     E,M     ;MOVE BYTE FROM DEFAULT BUFFER TO E
        CALL    WRITE   ;SEND IT
        MVI     D,255   ;GIVE RECEIVER SOME TIME
DELAY:  DCR     D       ;    BEFORE THE NEXT
        JNZ     DELAY   ;    CHARACTER IS SENT
        POP     H       ;RESTORE H
        INX     H       ;INCREMENT TO NEXT MEMORY LOCATION
        POP     D       ;RESTORE D
        DCR     D       ;SUBTRACT ONE FROM COUNTER
        JNZ     ANOTH   ;GET ANOTHER CHARACTER IF NOT DONE
        JMP     COPY    ;GO TRY ANOTHER READ
EOFILE: MVI     E,EOF   ;MOVE EOF INTO E
        CALL    WRITE   ;SEND IT
        LXI     D,NORMAL;READY MESSAGE
FINIS:                  ;WRITE MESSAGE GIVEN BY DE, REBOOT
        MVI     C,PRINTF;
        CALL    BDOS    ;WRITE MESSAGE
        LHLD    OLDSP   ;LOAD VALUE AT OLDSP INTO H & L
        SPHL            ;SWAP H&L WITH SP
        RET             ;RETURN
OPEN:   MVI     C,OPENF
        JMP     BDOS
READ:   MVI     C,READF
        JMP     BDOS
WRITE:  MVI     C,PUNF
        JMP     BDOS
ACK:    MVI     C,RDRF                                  →
```

```
        JMP     BDOS
NOFILE: DB      'NO SOURCE FILE$'
NORMAL: DB      'COPY COMPLETE$'
;
OLDSP   DS      2       ;STORE STACK POINTER VALUE HERE
        DS      64      ;32 LEVEL STACK
STACK:
                END
```

You will now exit DDT. Save the patched BIOS85:

SAVE 5 BIOS85.SYS <CR>

And return it to read-only status:

STAT BIOS85.SYS $R/O

This completes the patch. Disks SYSGENed from this disk will have the patch on them.

Transferring files with RECD and TRANS

Before starting this, use SYSGEN to prepare a new bootable disk on each system.

First, you'll need to type in the programs and assemble them. The programs don't absolutely need to end up on a SYSGENed disk. But it will probably be more convenient to have them on the system disk. Having PIP.COM on that disk may also be of some help.

To enter the programs, you'll need an editor and the following: ASM.COM or MAC.COM; LOAD.COM; and STAT.COM. You'll need them on both the H8 and the '100.

Now type in the TRANS.ASM and RECD.ASM programs into one computer and the RECD.ASM program into the other. Transmitting the TRANS program from the one to the other can be the first test of the process.

After the programs have been typed in, type ASM RECD on the first computer. And when the assembler is finished, type LOAD RECD to produce the final .COM file. Then, on the other computer, type ASM TRANS. And after the assembler is finished, type LOAD TRANS.

(Remember to type in only the program and not the numbers on the left. These numbers are what you will get after you assemble your program. As shown in Listings 1 and 2, the programs were assembled by ASM. If you're using MAC.COM, the format may look a little different. But the numbers should be the same.)

After both programs have been assembled and loaded, you are ready to try them out. Let's say that you put RECD.ASM on the H8 and TRANS.ASM on the '100. Now on the H8 type RECD TRANS.ASM and return. (If the program says COPY COMPLETE, then type RECD TRANS.ASM again.) The disk drive should come on and the cursor should stay on the line under the line you just typed. Then on the '100 type TRANS TRANS.ASM and return. The disk drive should come on. Wait until they both say COPY COMPLETE.

You now have copied a program from one system to the other. Next, assemble and load the TRANS program you have just transferred. Always set up the receiving end first, since you start to transmit as soon as you hit return.

Now you can copy any type of program in either direction. And the programs will accept drive specifications on either side.

In using these programs, I think you'll find that you increase the usefulness and convenience of both your '100 and your H8.

A quick summary

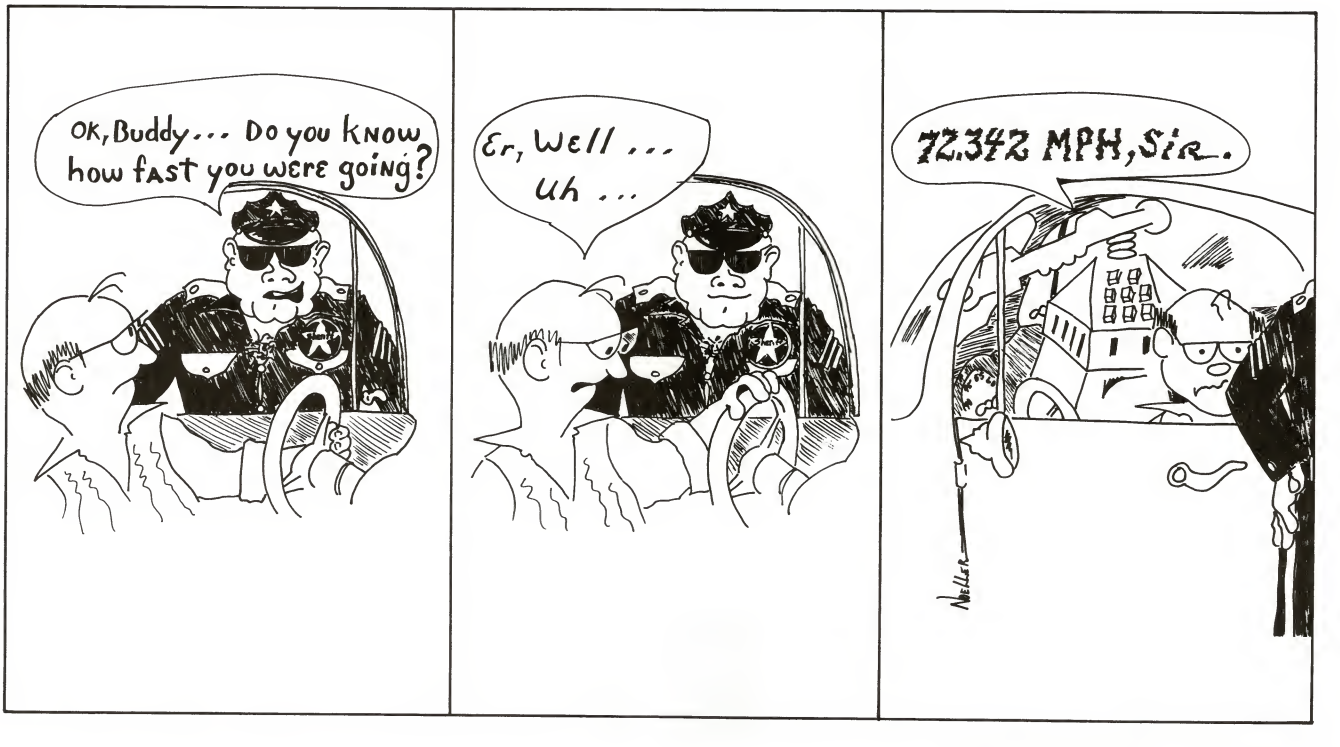
1. Make up the cable. (See text.)
2. SYSGEN a new CP/M disk for the H8.
3. Boot CP/M on the H8 with the new disk.
4. CONFIGUR the H8 disk for the proper port, 9600 baud. (See text.)
5. SYSGEN a new CP/M disk for the '100.
6. Boot CP/M on the '100 with the new disk.
7. CONFIGURe the '100 disk for 9600 baud, 8 data bits, no parity, no handshaking on the modem port. (See text.)
8. You can now transfer small ASCII-only files by the PIP method. (See text.)
9. Using DDT.COM or MAC.COM, patch BIOS85 on the '100 disk. (See text.)
10. On the '100, type "RECD TEXT.DOC <CR>".

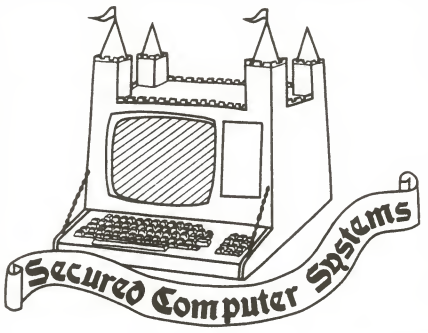
If the message "copy complete" comes on at this time, do 10 over.

11. On the H8, type "TRANS TEXT.DOC <CR>".

When the transfer is complete, you will get the message "copy complete." This should only take a few seconds.

12. You can transfer any type of files.





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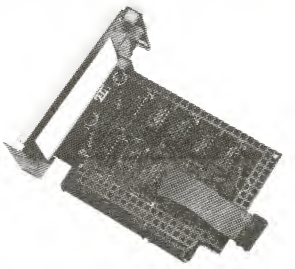

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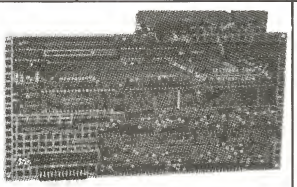

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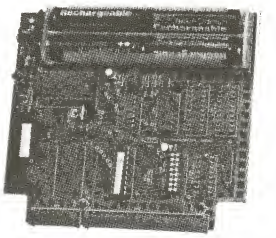

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Stan Lockhart

Error trapping in Microsoft BASIC can at times be very useful. But on the other hand, it can be frustrating to no end!

How many times have you written a program that you thought was error free? Then you ran it, only to see that nasty message come across your screen: "Type Mismatch in 3720"?

Or worse, you thought you had everything sewn up with a fancy error-trapping routine. Supposedly, it anticipated every error you were likely to make. And it told MBASIC what to do with them. Then your error-handling routine got one it couldn't handle. But MBASIC dispenses with all the usual error messages when it sees ON ERROR telling it to GOTO your error-handling routine. All you get is the error number and error line to play with. (MBASIC's attitude is that if you want to take the wheel, you can carry your own road map!)

Well, if this happens to you (as it does to me), the next step is usually to dig out the MBASIC manual; then look up the error number to find out what the computer didn't like. This can mean a lot of wasted time spent looking up the codes.

And looking up those codes is only going to tell you the run-time errors. It will point out the sort of errors that can actually prevent the computer from executing your program (syntax errors, divide-by-zero, etc.). MBASIC's error messages can't do any more.

I normally use this as a debugging tool during program development.

After you get *those* errors cleaned up, you will still have to sit down, run your program, and find any design deficiencies—such as computing the square of your checking balance rather than the balance itself. You will have to think up the user mistakes that could cause a crash—and allow for them. That's your job.

But you can't do that yet. You're still looking up error messages in the MBASIC manual.

Run-time errors, though, are exactly the kind that a *computer* is best suited to track down. That's MBASIC's job, and that's why those error messages are there in the first place. Why, then, should *you* be wasting time doing the computer's job? That time searching through the manual could be better spent on the keyboard, right? Well, search no longer, your dreams have come true!

The program presented in Listing 1 was written for MBASIC version 5.21 running under the CP/M operating system (version 2.2). It acts as a shell between you and your program. It's designed to find the error messages that MBASIC normally uses (which you lose when you trap for errors). It puts them in an array for your program to use if (heaven forbid) necessary.

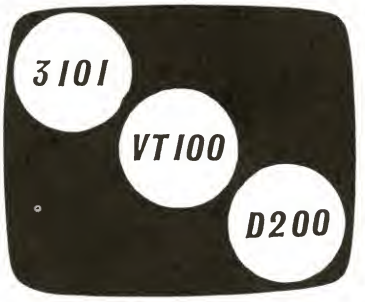
This shell is designed to be loaded first. Then your program is loaded. As presented here, your program will use line numbers 13 through 60000. This routine can also be saved via the

```
 1 ON ERROR GOTO 60001
 2 OPTION BASE 1: DIM ER$(67),ER%(40)
 3 D%=1204: ' Error messages are located at 1204 thru 1906
 4 FOR A%=1 TO 40: READ ER%(A%): NEXT A%
 5 FOR A%=1 TO 67: ER$(A%)="Unprintable Error": NEXT A%
 6 FOR A%=1 TO 40: ER$(ER%(A%))="": READ B%
 7 FOR C%=D% TO D%+B%: ER$(ER%(A%))=ER$(ER%(A%))+CHR$(PEEK(C%)):
   NEXT C%: D%=D%+B%: NEXT A%
 8 DATA 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20
 9 DATA 21,22,23,26,29,30,50,51,52,53,54,55,57,58,61,62,63,64,66,67
10 DATA 16,13,21,12,22,9,14,22,23,21,17,15,14,20,16,27,15,24,10,21
11 DATA 18,16,21,21,23,19,15,15,16,15,14,20,15,24,10,15,18,14,27,15
12 ' Main program here

60001 PRINT "Error #";ERR;" has occurred at line #";ERL;".  This is
      an '";ER$(ERR);"' error."
60002 STOP: RESUME NEXT
```

Listing 1. A routine to access MBASIC's error messages even when using your own error-trapping routine. This routine was written for use with MBASIC version 5.21, running under CP/M 2.2X03 for an H8A with 64K RAM, and H17 and H37 drives.

Turn your Z-100 into a:



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"ASCII" switch (,A), and merged with an existing program—providing there is room for lines 1-12 and 60001-60002.

I normally use this as a debugging tool during program development. Then I delete it from the program—after I am sure the error conditions that may arise are either handled or compensated for. The initial reason for deleting it is that it will slow your program by about 12 seconds. And it requires approximately 9.2 kilobytes of memory on top of your original program when running. (Now, if you have a computer with 128K or more of memory, leave it in if you wish. But my Heathkit H89 has only 64K, so I try to cut corners where possible!)

What it's doing

This shell is designed to run at the start of the program so that the error descriptions are available immediately for use. Line 1 is the required statement for error trapping, ON ERROR GOTO 60001. Line 2 sets up the arrays: one for the string-error messages, and one for the initial error-code numbers; with sizes of 67 and 40, respectively. Line 3 sets the address to begin retrieving the messages from memory.

Line 4 reads the error numbers (from data statements).

Line 5 sets the array ER$ to the message: "Unprintable Error." This takes care of the error codes for which MBASIC provides no description.

Line 6 blanks out the spaces (in array ER$) that we will use for the description; and it reads the length of the description.

Line 7 reads the error descriptions from memory, one letter at a time, into the required array position.

Lines 8 and 9 are the data statements that specify the error codes currently in use for MBASIC version 5.21. Lines 10 and 11 are the length of each message for use by the PEEK statement in line 7.

As the shell is currently written, you enter your program after line 12. If an error occurs, program execution will be transferred to line 60001 where the error number, error line, and our error description are printed. The STOP statement in the next line allows us to look at the error and program to determine if we can safely bypass the line. If so, all that needs to be done is type CONT and <RET> to use the RESUME NEXT statement. (If you haven't changed the program!!)

If you wish to try the shell by itself, add "13 STOP" to the program. Otherwise, you will get an error number 5 for line 65535, printing about 23 Cs instead of "Illegal Function Call." This is apparently caused by the lack of an END statement and by line 2's OPTION BASE 1 statement (which doesn't permit zero-width elements in the array DIMensioned by line 2).

I hope everyone who tries this shell will appreciate as much as I do the time it saves in testing.

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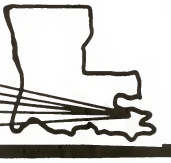

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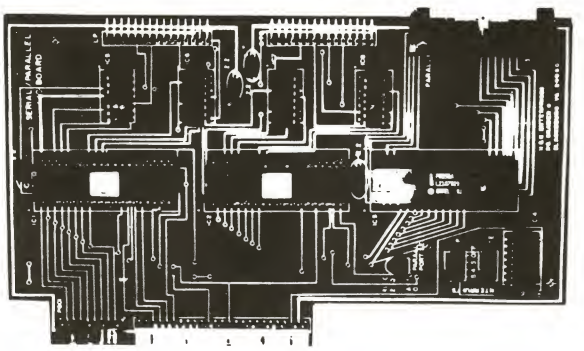

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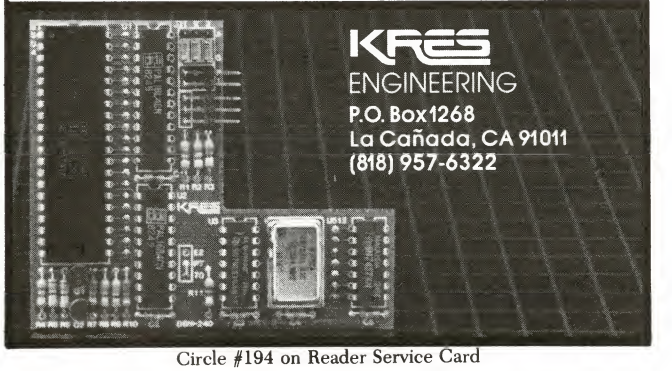

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Introduction to Pascal: Part 3

The final installment in this series includes a gift to the graduating class—a program to help solve cryptograms.

William Tavolga

This is the third and last installment in our series on Tiny Pascal. In this series, Tiny Pascal serves as a vehicle for BASIC programmers moving up to Pascal. (Offered both by SoftShop of Sudbury, Massachusetts, and by the Heath Users' Group, Tiny is powerful on its own merits as well as being an inexpensive, efficient introduction to the larger Pascals.)

The first installment appeared in *Sextant* #11, July-August 1984, and discussed points such as the program block, variables, and subroutines (procedures). In the second, we covered loops and repetitions, as well as functions (the other form of subroutines).

Most of this section will be devoted to Tiny Pascal's disk-file handling techniques, i.e., how to have your program put data into a disk file and how to retrieve it. (As before, my comments will be based mainly on the version of Tiny that runs under the Heath Disk Operating System (HDOS). But I will also note any differences in the version that runs under CP/M.)

You will find Tiny Pascal's file operations rapid and efficient. And they give you control over file contents well beyond that available from BASIC. In fact, the most recent version of Tiny Pascal has something that even some full Pascals do not support: the facility for random read/write operations.

As in previous installments, NL will be used to signify the new-line code 10. But remember that in CP/M the new-line code must consist of both the carriage return (13) and line feed (10).

In Tiny Pascal five input/output (I/O) channels are available to you at the same time, not counting the one used by the console terminal.

One of these five has actually been used in previous installments of this series. A WRITE to the screen employs channel 3. And the PRINT command uses the output of channel 3 to a printer (LP: in HDOS, and LST: in CP/M). In any WRITE command, as in WRITE('This is a string.'), you can replace the WRITE command with a PRINT; and the matter within parentheses will be sent to the printer instead of to the screen. (You may not see the effect immediately, depending on the kind of printer and the size of its buffer.) Channel 3 is strictly an output channel.

Channel 1 is a read channel: one that can accept data from a disk file. Channel 2 is a write channel for disk data. You cannot have both channels open to the *same file* simultaneously.

Channel 4 is open to a specific memory-buffer area set up by Tiny Pascal. This channel can be used to read and save a disk file to the buffer; or it can serve as a source for a file to be written to disk.

The eternal semicolon will always be with you.

Channel 5 is used for random access to a disk file. That is, the same file can be read from or written to via this channel.

Channel 1: read

The first step in reading a file is to open it. This is done by the statement:

```
RESET('FILENAME');
```

The filename can include a device specification and/or an extension. If no extension is given and the period is omitted, then the extension .DAT is assumed. That is, file name 'MYFILE' would default to 'MYFILE.DAT', while 'MYFILE.' would remain as given. If no device is specified, then the default is SY0:. (In CP/M, A: or current drive.)

Another way to specify the file name is:

```
RESET('?');
```

This results in an input request in which you can enter a string from the console, terminating in NL. In this way, you can enter a file name during the course of a program. As above, drive 0 is assumed, as well as the .DAT extension.

Take, for example:

```
WRITE('Enter name of file to read ');
RESET('?');
```

The last statement will even provide a "?" as a prompt. You can enter the filename string in lower- or uppercase (only uppercase in CP/M).

After you finish with the file, it must be properly closed. This happens automatically when the program ends. And under CP/M, a RESET call to another file name automatically closes the old file and opens the new one. But before a new file is opened under HDOS, the old file should be closed with the RESET command. To do this, we can use

```
RESET('*');
```

which will close the previously opened file.

This is especially important if you plan to open another file to read later in the same program. If you want to reuse the same file, however, you can reset the "pointer" to the start of the file with the command:

```
RESET(':');
```

To read from the file, you use the command statement:

```
GET(X);
```

The variable X would then accept the value of the next available byte in the file. Each such command will read the next byte, and so on. You would have to use some form of a loop to read a file:

```
RESET('XFILE.TXT');
REPEAT
  GET(X);
  WRITE(X);
UNTIL X='X';
```

This program will continue to run and print the contents of the file on the screen, byte by byte, until an X is found. Suppose the file had no X, what then? In such a case, the loop would run on indefinitely, repeating the last sector of the file until you stopped it with a CTRL-C. (In CP/M, you would probably go on to eternity until you reset the computer completely.)

Tiny Pascal provides the solution for you with a built-in Boolean value: EOF. It normally stays at 0; but when the end of the last sector is reached, it turns to 1. The loop above could then be:

```
REPEAT
  GET(X);
  WRITE(X);
UNTIL EOF;
```

In CP/M, the EOF value is not built-in, and has to be declared as:

```
CONST  EOF = 26;
```

Then your last statement would become: UNTIL X=EOF;

You can, of course, put your data into an array, then write the array on the

screen; but then you must include a counter:

```
I:=0;    ! don't forget to zero the counter !
REPEAT
  I:=I+1;
  GET(X[I]);
UNTIL EOF;
```

There is another integer value available to you HDOS users: IORESULT. When a file is open, this is normally some positive number. But when EOF becomes 1, then IORESULT becomes 0. This value is actually set by what happened at the last I/O operation.

If, however, you try to open a file that does not exist, IORESULT becomes some value above 0, just as if a real file had been opened. If you should try to work with such a file, you would either get some bizarre result, or the computer might go bonkers, requiring system reset.

To avoid this, one trap to use is:

```
RESET('XFILE.TXT');
IF IORESULT=0 THEN
  REPEAT
    GET(X);
    WRITE(X);
  UNTIL EOF;
RESET('*');
```

Another trap for non-existent files is:

```
RESET('XFILE.TXT');
IF IORESULT<>0 THEN
   RESET('*')
   ELSE  REPEAT
            GET(X);
            WRITE(X);
         UNTIL EOF;
```

Unfortunately, there is no equivalent to IORESULT in the CP/M version. But the same effect can be accomplished by a special function using system calls to CP/M's Basic Disk Operating System (BDOS).

The GET(X); statement will take one byte, and only one byte. That byte can be any value from 0 to 255. If you WRITE(X);, you will see the ASCII equivalent (first seven bits only). But if you WRITE(X#);, then you will see the actual byte value. To read a numerical integer value, you must say GET(X#);. (See more about this below in the comments on PUT.)

What kind of animal is a TYPE?

In Pascal (and many other structured languages), all variables have to be classified and assigned to a TYPE. For example, the letter 'C' is a CHAR (for character); the number '12' is an INTEGER; and the number '2.7' is a REAL. You can even define your own TYPEs. (For example, if you defined a TYPE called MONTH, the permissible values for variables of that TYPE might be JANUARY, FEBRUARY, MARCH, etc.)

In Tiny Pascal, though, everything is an INTEGER, even letters. A 'C' has a value of 67 in ASCII, and is therefore regarded as an integer.

Even though Tiny does not recognize any other type, the word TYPE is reserved by the compiler, and you may not use it in your program as an identifier.

Channel 2: write

The syntax for Channel 2 is much the same as for Channel 1.

REWRITE('MYFILE.TXT'); will open the channel.

REWRITE('?'); will request a file name to open.

REWRITE(':'); will reset pointer to first byte of the file.

REWRITE('*'); will close the channel.

In CP/M, the file is closed by sending CTRL-Z (26). You can do this by saying PUT(26);. Or you can define CONST EOF=26; and then say PUT(EOF);.

The IORESULT value is of no use here, since as soon as you open a file with the REWRITE command, you also create a new file by that name. This effectively destroys the contents of any pre-existing file with that name. Once it is open, you can write into the new file with the command:

```
PUT(X);
```

Assuming you have an array of length Z of data available, you could store it, byte by byte, as follows:

```
WRITE('Enter file name ');
REWRITE('?');
FOR I:=1 TO Z DO
   PUT(X[I]);
REWRITE('*');
```

This, however, would work only so long as your values were all ASCII characters. If you want to save a numerical integer value, then you use the # sign. Let's take the case above, but assume that the array is of integer numbers. The program fragment becomes:

```
WRITE('Enter file name ');
REWRITE('?');
FOR I:=1 TO Z DO
   PUT(X[I]#,NL);
REWRITE('*');
```

This procedure actually saves the integer *in ASCII form* on the disk; and the NL serves as a separator between the successive values of the integer X[I]. The NL code *must* be used; otherwise, the GET command will give you an input error message, and the program will die an instant death. (In this case in CP/M, *do not* add the carriage return code 13.)

To retrieve such integer data, you would say:

```
WRITE('Enter file name ');
RESET('?');
FOR I:=1 TO Z DO
   GET(X[I]#);
RESET('*');
```

Notice that the NL is *not* included in the GET statement. To understand these differences better, you should experiment with programs like the above, and examine the results on the disk with a DUMP program. (Under HDOS, if you want the same results in split-octal, then

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use % instead of #. The % will give you hexadecimal under CP/M.)

With some printers, the PRINT command can leave the external buffer unflushed, until the program ends and closes all channels. This is especially troublesome if you request a hardcopy of a few lines in the middle of a long program. The solution to this is to open the printer as a file, just as you do in many versions of BASIC. The technique would be:

```
REWRITE('LP:');
FOR I:=1 TO 100 DO
   PUT(X[I]);
PUT(NL);      ! needed to flush printer buffer !
REWRITE('*');
```

In this instance if you are printing integer numbers, then your PUT(X[I]#); should *not* include the NL, unless you specifically want a new line printed. (Add the necessary CR (13) in CP/M.)

Channel 4: load or store

Tiny makes available a section of memory as a buffer or storage area. This amounts to 4,096 bytes, and is located from address 042.200 to 062.177. You can poke instructions into this buffer for later retrieval; or you can copy a file from the disk directly into this area with the command:

```
LOAD('FILENAME');
```

With this command, that 4K swatch of memory is first cleared, then the file is read and dumped into this memory. If the file is in .ABS format, then the first 8-byte header is not part of the executable code. So Tiny skips it. This means that if you LOAD a viable program, you can run it by giving the command statement:

```
CALL(%42200);
```

This can be a useful area in which to load assembly subroutines. And if the subroutine ends with a RETURN opcode, the program control will return to the next statement after the CALL. The file will be loaded up to the limit of available memory (or until an end-of-file is detected). So you are limited somewhat in that programs used this way cannot be larger than 4K.

The reverse of the LOAD function can be accomplished with the command:

```
STORE('FILENAME');
```

In this case, a new file is created; and the 4K or less of material saved in the buffer will be moved into that file on the disk. With this facility, you can create a file during your program, poke it into this memory area, and then save it as a disk file.

In the CP/M version the LOAD command is available, but not STORE.

Channel 5: random access

The available commands for channel 5 are:

UPDATE('FILENAME'); — open to read or write;

UPDATE('?'); — request file name to open;

UPDATE('*'); — close file.

In CP/M, the random file is closed with the CLOSE; command.

To retrieve data, you use the statement:

```
SEEKREAD[S];
```

Notice the use of [ ] rather than parentheses. The integer S represents the sector number of the file. This command retrieves an entire HDOS sector of 256 bytes and puts it into a buffer that is part of every Tiny Pascal program. The buffer has the reserved array of UBUFFER[0] ... UBUFFER[255]. You can address this piece of memory to examine its contents:

```
A:=UBUFFER[X];
WRITE(A);
```

or, simply

```
WRITE(UBUFFER[X]);
```

Or you can poke a value into it:

```
UBUFFER[X]:=A;
```

(Note: in CP/M this buffer is one CP/M sector, i.e., 128 bytes.) After you are through fooling around with the buffer, you can return its contents to the disk with the command:

```
SEEKWRITE[S];
```

In this way you can recover any sector of a file, examine it, print it, change it,

Reserved Words in Tiny Pascal

AND	CONST	FUNCTION	PRINT	STORE h
ARRAY	DISIN	GET	PROC h	THEN
BEGIN	DIV	IF	PROCE	TO
BDOS c	DO	INTEGER	PROCEDURE	TYPE*
CALL	DOWNTO	IORESULT h	PUT	UBUFFER
CASE	ELSE	LOAD	READ	UNTIL
CHAIN h	END	MEM	REPEAT	UPDATE
CLOSE c	ENIN	MOD	RESET	VAR
CONCE	EOF h	NOT	REWRITE	WHILE
CONCL h	EXIT	OF	SEEKREAD	WRITE
CONCN h	FOR	OR	SEEKWRITE	
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and then write it back in changed form, if you wish.

If you request a sector number beyond the size of your file, Tiny Pascal will obediently go ahead and retrieve the next sector in line, even if it belongs to some other file. If you're not careful, you can clobber a neighboring file. In programming, it is wise to use EOF and IORESULT values.

If you write a program for yourself, then you can put up with an occasional crash. But if you are writing programs for someone else to run, then it pays to make them "bullet-proof." And in this case, that means: check your EOF and IORESULT values frequently—certainly whenever you open a file.

In doing so, remember that when you try to open a file with UPDATE, if the file is not present, a positive value of IORESULT appears. If you request a sector beyond the range of the file, EOF will acquire a value of 1. (Unfortunately, the CP/M version does not include these values, and you will have to use BDOS calls to accomplish the same checks.)

External files to include

As you continue programming in Tiny Pascal, you will acquire a collection of subroutines that are sort of general-purpose procedures and functions. There are several such included on the disks that you get with your compiler. Instead of copying them over into your program each time, you can simply write the "include" command:

$FILENAME

There are four syntax constraints. The command must be on a line of its own. The $ must be in the left-most position on that line. Only the $ and the file name may be on that line. And the complete name and device must be given; but the default drive and extension can be set by the CONFIGUR.ABS program included with the HDOS version of Tiny Pascal.

Just make sure that the include command is placed in the source code in advance of where you will call up the included procedure; otherwise, the compiler will flag an error and stop.

Miscellaneous comments

The documentation that comes with your Tiny Pascal compiler includes some directions on the use of the CONFIGUR.ABS program, and details on the operation of the compiler.

A list of reserved words is also given. You may not use these words as identifiers for procedures, variables, etc. However, you *can* use them in combination with other letter groups. For example, IF will be rejected as an identifier on its own; while IF_THEN or NOTIF will be accepted.

There is one error in my copy of the documentation, where the use of the # and % is described. In no case—whether number or variable identifier—should these symbols be used in front; i.e., #23 will be flagged as an error. In addition, the use of the underline in an identifier is ignored in my compiler. So NO_TIF would be seen as the same as NOT_IF or NOTIF. Check your documentation carefully on these points.

The documentation also gives a memory map to show where Tiny Pascal stores various items in memory. This can be very useful. It gives the locations where Tiny will place file names, internal values (such as the value of EOF) and, most important, the user's memory areas.

The CP/M version has a special pseudo-random-number function. And the documentation briefly describes how to make system calls to CP/M's Basic Disk Operating System (BDOS). For example, since the CP/M version lacks the no-echo console mode, we can duplicate it by using a BDOS call, as has been done in Listing 1.

Before using the BDOS calls in CP/M, however, you should look up the table of BDOS functions in the CP/M documentation, and see how they operate in assembly language. This will give you a better understanding of how to use these calls in Tiny Pascal. (You might also want to take a look at J. C. Hassall's article in *Sextant* #5, Spring 1983, "An Introduction to CP/M for Assembly Language Programmers.")

Between the BDOS[N] function and

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the ability to peek and poke, you can include any assembler or machine-language routine in Tiny Pascal; and you can set it up as a reusable procedure. You can do this just as easily in the HDOS version.

Comparisons with other Pascals

Once you have mastered the programming techniques of Tiny Pascal, the jump to standard Pascal is relatively easy. The biggest difference you will find will be having more than just one variable type; but the ability to deal with real numbers will be a pleasure. Also, each version of Pascal has its particular ways of input/output management, as well as its own variations in syntax. But the eternal semicolon will always be with you, hanging at the end of every statement.

My own experience has been that learning Tiny Pascal was an invaluable prelude for writing in other Pascals. With the additional variable types in the larger Pascals, of course, the language becomes much more powerful; large and complex numbers can be handled.

The language also becomes more powerful in the sense that there are many more built-in functions available; and time- and space-saving combinations of records and variables can be assembled.

There is a price for all this. The actual writing becomes laborious and there is a vastly increased number of syntactical rules to look up or remember. Compilation is slower, and leaving out one miserable semicolon in a long program can cost you up to ten minutes of compilation and assembly time.

```
CONST  BDSREG = $11FC;  ! BDOS command register address !

VAR   X : INTEGER;

PROCE INKY;
  BEGIN
    MEM[BDSREG]:=$FF; ! poke FF into command register !
    REPEAT
      X:=BDOS[6];     ! now peek at the BDOS !
    UNTIL X>0;        ! until it has a character !
  END;

BEGIN                 ! main program !
  REPEAT
    WRITE(13,10,'Enter keystroke : ');
    INKY;             ! go and wait until key is pressed !
    WRITE(13,10,'You pressed : ',X');
  UNTIL X='X';
END.
```

Listing 1. The CP/M version of Tiny Pascal lacks the no-echo console mode. We can duplicate it by using a BDOS call, as here.

Tiny Pascal compiles into something called p-code. This is a temporary file (sort of a relocatable module) that is immediately translated (by the TRANSLAT program) into absolute binary code. A directly runnable .ABS or .COM program is then generated. Tiny's compilation is rapid, rarely longer than two or three minutes.

Unlike Tiny, most high-level Pascal compilers only provide you with program code which still needs an interpreter to run it. For example, running a program generated by JRT Pascal requires JRT's interpreter and library. In terms of disk and memory space, there is really little gain over writing your program in BASIC. The execution speed, however, is much higher.

JRT Pascal, by the way, was an excellent buy. (If you ever got delivery, that is, before the company suspended operations.) It has most of the features of Pascals costing over $100, and even some extensions beyond. If you are not an experienced Pascal writer, however,

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beware! JRT's documentation is quite sketchy and contains some critical errors.

Another good value, in my opinion, is Lucidata Pascal, available for both HDOS and CP/M. Most of the standard Pascal features are present here; but some syntactical requirements are different and may be confusing. One major advantage is that a TRANSLAT program is available to put your program into independent binary format. The Lucidata documentation is good, but you still need to get some standard Pascal texts to understand it. (Lucidata Pascal was reviewed by Hugh Kenner in "Pascal Elucidated," *Sextant* #6, Summer 1983.)

After trying some half-dozen different Pascal versions, I can say that the best by far is Turbo Pascal, from Borland International. It has almost all the features of the so-called Standard, and many more; it includes an excellent editing program that can be configured in an infinite number of ways; it produces fast, compact programs in binary code; the documentation is excellent; the price is frankly cheap; and best of all, the compilation time is incredibly short. All the glowing reports on it are true.

To compare Tiny, JRT, Lucidata, and Turbo, I wrote my program CRYPTAID in each of these versions of Pascal. And I must say that the Tiny Pascal version (found in Listing 2) is more compact and runs much faster than any of the others. Perhaps a more experienced Pascal-er can find ways of compressing my code, but personally I find Tiny is more efficient—at least for the jobs I do.

Moving on to "C"?

Recently, I have learned to use the "C" language, and have rewritten CRYPTAID and some of my other Tiny Pascal programs in "C." Surprisingly, the only difference I found was that Tiny Pascal requires more words in its source code. Otherwise the two produce about equally compact and efficient code. Only assembly language produced smaller and faster running programs.

Your experience with semicolons will also prove useful if you should go into the "C" language, whose format of declarations, procedures, functions, and program blocks will look familiar. However, "C" has a much greater potential than Tiny Pascal.

The main advantage of "C" is its portability. There are "C" compilers available for almost any CPU on the market. And they all adhere strongly to a single standard. Actually, the "C" language in its basic form is almost as limited as assembly language. But its strength is the huge library of functions that is available and which can be readily augmented. Thus a source code written on one microcomputer can be compiled and run on almost any other microcomputer.

The transfer from writing Tiny Pascal to writing "C" was not difficult at all. If you have had no previous programming experience except BASIC, I highly recommend Tiny as a prelude to "C."

Putting it all together

Now we can put a good deal of this together into a usable program—one which you will be able to expand and modify to your heart's content.

The program is CRYPTAID, mentioned above, and shown in Listing 2. It is not just an exercise program. If you compile it, it will actually do something interesting.

CRYPTAID can assist you in solving the typical simple substitution cryptograms that are usually found in newspapers, magazines, etc. The actual solution is not done by the computer. Instead, the computer just acts as an infinitely erasable scratch pad, and encourages you to make quick guesses. Your solution time is significantly decreased, as well as the drudgery of erasing, moving letters, etc.

Listing 2. CRYPTAID.PAS is designed to help you solve cryptograms. It doesn't do the actual solving, but rather serves as an infinitely eraseable scratchpad. It also serves as a review of this series on Tiny Pascal.

```
! PROGRAM CRYPTAID.PAS !

CONST  NL = 10;   ! line feed - also generates carriage return in HDOS !
       CR = 13;   ! carriage return !
     ! CP/M requires both NL an CR as end of line indicators,
       when revising this program for CP/M Tiny Pascal, use the additional CR !

VAR  I, J, K, X, Y, Z : INTEGER;  ! miscellaneous counters and variables !
     LENGTH : INTEGER;  ! variable for total length of cryptogram with spaces !
     FINISH : INTEGER;  ! use as Boolean value to exit program !
     ORIG, DECOD : ARRAY [300] OF INTEGER;
         ! original and decoded values of cryptogram characters !
         ! we set a limit of 300 on the length of the cryptotext - far
            beyond the average !

PROCE RVID; BEGIN WRITE(27,'p') END;   ! reverse video on screen !
PROCE NVID; BEGIN WRITE(27,'q') END;   ! normal video on screen !
PROCE L25; BEGIN WRITE(27,'x1',27,'Y',56,32,27,'l') END;
         ! enable 25th line, set cursor there, and clear line !
PROCE NO25; BEGIN WRITE(27,'y1',27,'H') END;
         ! disable 25th line and home cursor !

PROCE INSTR;   ! print instructions on 25th line !
  BEGIN
   L25;   ! enable 25th line !
   RVID; WRITE('f1'); NVID; WRITE('=save file   ');
   RVID; WRITE('f2'); NVID; WRITE('=retrieve file   ');
   RVID; WRITE('f3'); NVID; WRITE('=restart   ');
   RVID; WRITE('f4'); NVID; WRITE('=hardcopy   ');
   RVID; WRITE('f5'); NVID; WRITE('=quit');
 END;

PROCE INTRO;      ! print introductory material !
                  ! add CR after each NL if in CP/M !
 BEGIN
  WRITE(27,'E',27,'v');      ! set console to wrap-around text !
  CONCE;                     ! set console to character input with echo !
  WRITE(9,9,9,'CRYPTAID by Bill Tavolga',NL);
  WRITE('Solutions to substitution cryptograms made easy.  ');
  WRITE('Enter the cryptogram below.',NL);
  WRITE('Next enter any letter from the cryptogram, then its new value.',NL);
  WRITE('All punctuation marks, numbers, and symbols can be included.',NL);
  WRITE('Use the space bar or RETURN to cancel value.',NL);
  WRITE('CRYPTAID can be used to create new cryptograms.',NL);
  WRITE('Use special keys to save or retrieve file from disk or provide ');
  WRITE('hardcopy.',NL);
 END;

  ! this next procedure will work in both HDOS & CP/M and it is equivalent
    to calling a no-echo character input - with corrections for
      hitting delete, backspace or escape keys !

PROCE INKEY;      ! keyboard input control to eliminate unwanted echoes !
          ! in HDOS this can be simplified by using CONCN; command !
  BEGIN
    READ(Z);               ! read a input and print on screen !
     CASE Z OF
      127 : BEGIN I:=I-1; Z:=8; WRITE(8,' ',8); END;
       8  : BEGIN I:=I-1; WRITE(' ',8); END;
                ! if its DELETE or BACKSPACE, adjust cursor and erase !
    ! If you are using CP/M 85 in a Z-100, you may have to make some changes
              in the adjustments for DELETE and BACKSPACE inputs !
       27 : I:=I-1    ! if ESCAPE then adjust for accidental special key input !
       END;
    IF (Z<32) AND (Z<>NL) THEN INKEY;    ! use CR instead of NL in CP/M !
               ! if non-printable character, reject and get another !
  END;

   ! this procedure permits you to use any printable character in your  →
```

```
cryptotext - how could you restrict it to upper case letters only?
remember you may need punctuation marks !

PROCE CRYPT;     ! enter original cryptogram !
  BEGIN
    FOR I:=1 TO 300 DO ORIG[I]:=0;  ! clear variable array !
    WRITE(27,'Y',40,32,'Enter your original cryptogram here ');
    WRITE('(maximum length 300 letters & spaces) : ',NL,NL);
                              ! add CR after each NL if in CP/M !
    WRITE(': ');
    I:=0;  CONCL;   ! set counter I to 0, and clear console buffer !
    REPEAT
      I:=I+1;       ! count and get printable character from keyboard !
      INKEY;
      ORIG[I]:=Z;   ! save it in cryptogram array !
    UNTIL (ORIG[I]=NL) OR (I>300);
             ! do it until RETURN hit or limit reached !
             ! use CR instead of NL here in CP/M !
    LENGTH:=I-1; CONCL;  ! LENGTH is counter-1, and clear buffer !
    FOR I:=1 TO LENGTH DO
        IF ORIG[I]=' ' THEN DECOD[I]:=' ' ELSE DECOD[I]:='_';
          ! clear DECOD array making all underlines or spaces as needed !
  END;
   ! How could this be modified to accept or force only caps. and letters ? !

PROCE ERROR;   ! message to show invalid keyboard entry !
  BEGIN
    WRITE(27,'Y',52,37,27,'1');          ! set cursor and clear line !
    WRITE('Invalid entry ... press any key to proceed .. ');
    READ(K); CONCL;            ! read keyboard input and clear buffer !
  END;

PROCE SOLU;     ! print the solution array !
  BEGIN
    WRITE(27,'Y',46,32,'= ');  ! set cursor !
    FOR I:=1 TO LENGTH DO
       WRITE(DECOD[I]);
  END;

PROCE SAVE;   !  save puzzle as file on disk !
  BEGIN
    L25; CONLE;              ! do not use CR after NL here in CP/M !
    WRITE('Enter file name to save (.DAT default) ');
    REWRITE('?');            ! request filename input, and open to write !
    K:=349; PUT(K#,NL);      ! save a key number to identify usable file !
    PUT(LENGTH#,NL);         ! save cryptogram length value !
    FOR I:=1 TO LENGTH DO PUT(ORIG[I]);   ! save original and solution arrays !
    FOR I:=1 TO LENGTH DO PUT(DECOD[I]);
    REWRITE('*');            ! close file - use PUT(26); in CP/M version !
    INSTR; CONCE;
  END;

PROCE REJECT;
  BEGIN
     L25; WRITE('File unreadable or unavailable .. press any key .. ');
       CONCE; READ(K); CONCL; INSTR; J:=1;
  ! read input, clear buffer, rewrite instructions, set J flag to show reject !
  END;

PROCE RECALL;   ! retrieve puzzle from disk file !
  BEGIN
    L25; CONLE;
    WRITE('Enter file name to recall (.DAT default) ');
    RESET('?');  ! request keyboard input and open file to read !
      IF IORESULT<>0 THEN REJECT ELSE       ! cannot be used in CP/M !
            ! standard CP/M error message will appear if file not present !
      BEGIN    ! omit in CP/M !
        J:=0;  ! zero the J flag to show successful file opening !
        GET(K#);  ! see if first value correct key !
        IF K<>349 THEN BEGIN   ! if not, then reject it !
           RESET ('*');   ! close file -- do not use in CP/M version !
           REJECT;  END
            ELSE
       GET(LENGTH#);                      ! if OK, the get LENGTH value !
       FOR I:=1 TO LENGTH DO GET(ORIG[I]);       ! retrieve arrays !
       FOR I:=1 TO LENGTH DO GET(DECOD[I]);
       RESET('*');           ! close file -- do not use in CP/M version !
       CONCE;
       WRITE(27,'Y',40,32,27,'1','Cryptogram :');
       WRITE(27,'Y',42,32,': ');  ! set cursor !
       FOR I:=1 TO LENGTH DO WRITE(ORIG[I]);         ! print cryptogram !
       SOLU;                    ! print solution array, and instructions !
       INSTR;
      END;           ! omit in CP/M !
  END;

PROCE HARDCOPY;    ! output to printer - HDOS version !
      ! to rewrite for CP/M, each NL must be preceded or followed by CR,  →
```

Virtually every line is annotated, so you should be able to see why and how the instructions are written. I hope that you can generate your own ideas as to how some of CRYPTAID's routines can be done differently. Maybe your way will be better, or more elegant, or more efficient. I have interpolated into the comments some ideas for you to try.

I might add that my wife (who is a word-puzzle fan) and I have had much fun in using this program to solve the daily cryptograms in our newspaper. I hope you will enjoy it, as well as learn something from the program itself.

In using CRYPTAID, the first step is to enter the cryptogram (usually called "cryptotext") exactly as it appears, with punctuation marks, spaces, and letters. (Although this version of the program will accept lower- as well as uppercase letters, you should consistently use one or the other.)

When finished, press RETURN. For each character space in the cryptotext, equivalent blanks will appear below. Then enter any letter or character that you wish to evaluate. Only those characters present in the cryptotext will be accepted.

Next, enter the character to be substituted, and it will appear in the appropriate spots of the solution string (called "plaintext"). For any punctuation marks that you wish to transfer without alteration, just press the same character twice.

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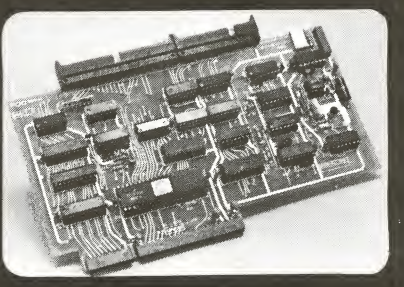

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```
          and all PUT statements replaced by PRINT !
  BEGIN
    REWRITE('LP:');     ! open printer as an output file - not used in CP/M !
    PUT('Cryptogram : ',NL,NL);          ! print headings and arrays !
    FOR I:=1 TO LENGTH DO BEGIN
      PUT(ORIG[I]); IF I MOD 80=0 THEN PUT(NL); END;    ! NL at 80 characters !
    PUT(NL,NL,'Solution : ',NL,NL);
    FOR I:=1 TO LENGTH DO BEGIN
      PUT(DECOD[I]); IF I MOD 80=0 THEN PUT(NL); END;
    PUT(NL,NL,NL);
    REWRITE('*');       ! close printer file -  do not use in CP/M !
  END;


PROCE FKEY;               ! special function keys !
    ! program will read character following ESCAPE when special key is hit !
  VAR  Q : INTEGER;
  BEGIN
    READ(Q); CONCL;       ! read code character, clear console buffer !
    CASE Q OF
     'S' : SAVE;          ! f1 = ESC S !
     'T' : RECALL;        ! f2 = ESC T !
     'U' : BEGIN INTRO; CRYPT; SOLU; END;  ! f3 = ESC U - erase and restart !
     'V' : HARDCOPY;      ! f4 = ESC V !
     'W' : FINISH:=1      ! f5 = ESC W, change Boolean FINISH value !
     ELSE ERROR END;      ! if something else, then flag an error and return !
  END;


PROCE ENTRY;            ! enter a letter to be decoded !
  VAR  CHK : INTEGER;   ! use as Boolean value !
  BEGIN
    WRITE(27,'Y',52,37,27,'J');         ! set cursor position !
    WRITE('    Select cryptogram letter to decode : ');
    CONCL;  CHK:=1;                     ! clear buffer, set CHK to 1 !
    READ(X);                            ! read keyboard input !
    IF (X=' ') OR (X=NL) THEN X:=2;
     ! if space bar or line feed, then change to unprintable value !
          ! this will eliminate possible spacing confusion !
    IF X=27 THEN BEGIN FKEY; IF NOT FINISH THEN ENTRY END ELSE
          ! check if ESCAPE hit - all special keys send ESCAPE code first !
          ! if ESCAPE sent, go to FKEY procedure -
             if FINISH still 0 then do ENTRY again, otherwise exit !
      BEGIN
        FOR I:=1 TO LENGTH DO          ! scan to see if X exists in crypto. !
          IF X=ORIG[I] THEN CHK:=0;    ! if a match, change CHK to 0 !
        IF CHK THEN BEGIN ERROR; ENTRY; END;
          ! if no match, then flag an error and try again  !
      END;
  END;

   ! At this point, in my longer version of this program, I added a couple of
    routines that permit me to scan quickly through the entire alphabet or
    only through the vowels, at any spot in the cryptogram.  Can you come
    up with a routine?  If you give up, send me an 'sase' and I'll show you
    how I did it. !

PROCE SUBS;    ! substitute decoded letter in solution array !
  BEGIN
    WRITE(NL,'             New value (space to cancel)');  CONCL;
    READ(Y);  CONCL;            ! read keyboard input & clear buffer !
    IF (Y=' ') OR (Y=NL) THEN Y:='_';
      ! if space or line feed, change it to underline !
          ! this will cancel a previous decoded entry !
    FOR I:=1 TO LENGTH DO
      IF X=ORIG[I] THEN DECOD[I]:=Y;
        ! scan solution array, and make changes where there is a match !
    WRITE(27,'l');     ! erase line and get another !
  END;

BEGIN                         ! main program !
   FINISH:=0;                 ! set Boolean FINISH value to 0 !
   INTRO;                     ! print introduction first !
   WRITE('Press X to recall a file, any other key to proceed.. ');
   READ(K); CONCL; WRITE(27,'l'); J:=1;
         ! read keyboard, clear buffer, erase line, set J flag to 1 !
   IF K='X' THEN RECALL;      ! if X hit then get a file !
   IF J THEN                  ! if J=1 then file was not retrieved !
     BEGIN
      INSTR; J:=0;            ! print instructions and reset J flag !
      CRYPT;                  ! get the original cryptogram !
      SOLU;                   ! print the blank solution array !
     END;
  REPEAT                      ! get decoded values until you want to quit !
    ENTRY;
    IF NOT FINISH THEN BEGIN SUBS; SOLU; END;
  UNTIL FINISH;
  NO25; WRITE(27,'z');        ! clear 25th line, restore console modes !
END.
```

This program will accept any printable character, and will permit you to use the same substitute for different letters, although that is not generally done in standard cryptograms.

The line of instructions at the bottom of the screen lists the use of special keys to save or retrieve data from a disk, or to request a hardcopy. (The program uses driver LP: under HDOS).

CRYPTAID can also be used to create cryptograms. Simply enter the plaintext instead of a cryptogram, and then choose whatever substitution characters you wish to make the puzzle confusing. Spaces between words are preserved, but otherwise you can use any printable character you wish.

Ordering Information

Tiny Pascal, compiler and programs (HDOS), $20.
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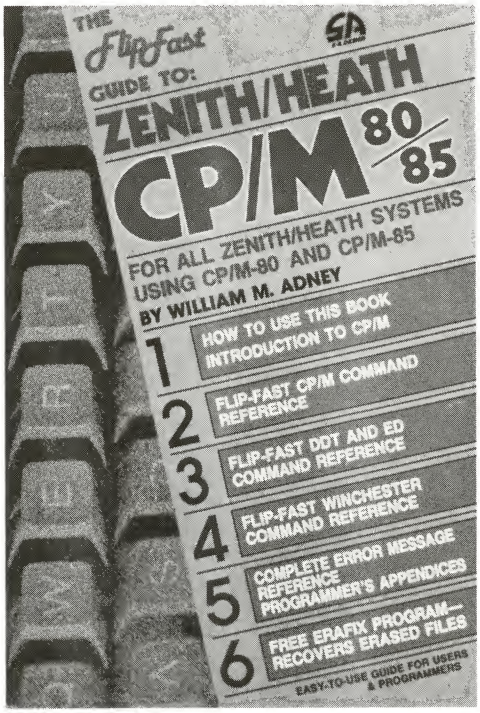
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2 FLIP-FAST CP/M COMMAND REFERENCE
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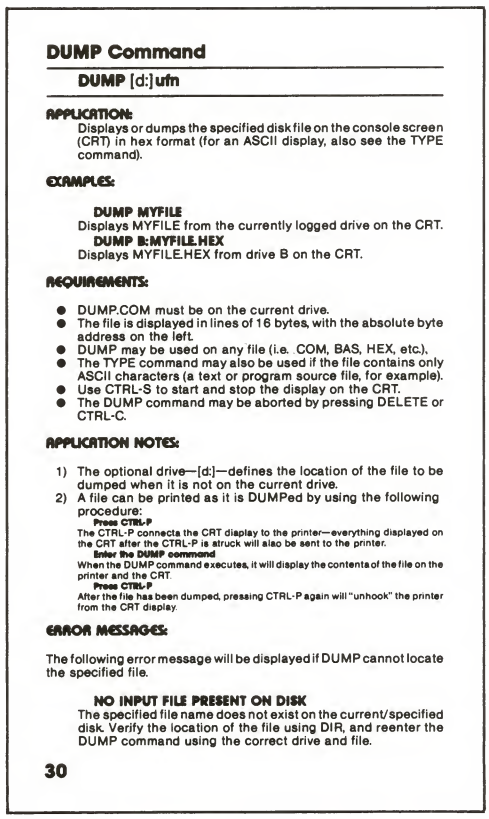

DUMP Command

DUMP [d:]ufn

APPLICATION:
Displays or dumps the specified disk file on the console screen (CRT) in hex format (for an ASCII display, also see the TYPE command).

EXAMPLES:

DUMP MYFILE
Displays MYFILE from the currently logged drive on the CRT.
DUMP B:MYFILE.HEX
Displays MYFILE.HEX from drive B on the CRT.

REQUIREMENTS:

- DUMP.COM must be on the current drive.
- The file is displayed in lines of 16 bytes, with the absolute byte address on the left.
- DUMP may be used on any file (i.e. .COM, BAS, HEX, etc.).
- The TYPE command may also be used if the file contains only ASCII characters (a text or program source file, for example).
- Use CTRL-S to start and stop the display on the CRT.
- The DUMP command may be aborted by pressing DELETE or CTRL-C.

APPLICATION NOTES:

1) The optional drive—[d:]—defines the location of the file to be dumped when it is not on the current drive.
2) A file can be printed as it is DUMPed by using the following procedure:
Press CTRL-P
The CTRL-P connects the CRT display to the printer—everything displayed on the CRT after the CTRL-P is struck will also be sent to the printer.
Enter the DUMP command
When the DUMP command executes, it will display the contents of the file on the printer and the CRT.
Press CTRL-P
After the file has been dumped, pressing CTRL-P again will "unhook" the printer from the CRT display.

ERROR MESSAGES:

The following error message will be displayed if DUMP cannot locate the specified file.

NO INPUT FILE PRESENT ON DISK
The specified file name does not exist on the current/specified disk. Verify the location of the file using DIR, and reenter the DUMP command using the correct drive and file.

30

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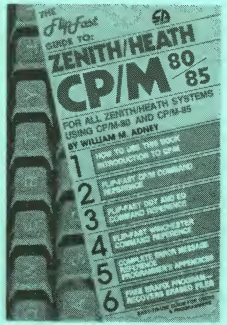

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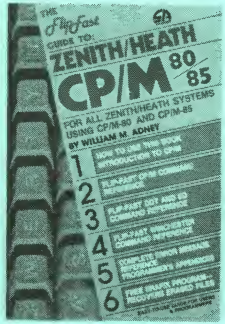

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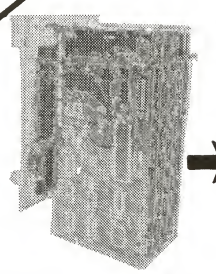

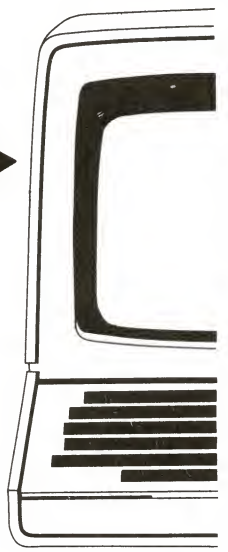

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Wormrace

This fast-paced competition pits worm against worm, user against computer.

Raymond Dotson

WORMRACE.BAS is an extremely short game of chance. It's also an operational example of applied graphics in action. Although it's written in CP/M MBASIC, conversion to other BASICs should be relatively easy.

The game itself is quite simple. Four worms are going to "race" across the screen. You tell the computer which one you think (hope?) will win. They race and you see how good your sporting judgement was. (Of course, you're betting against the computer, so don't be surprised if your worm doesn't always come in first.)

As it's presented in Listing 1, WORMRACE is written in Microsoft BASIC version 5.1, for use under the CP/M operating system. Looking at the listing, you can see that I use lines longer than the normal terminal width. When you enter the program, lines are broken with LINE FEED.

True, the program could have been written with one statement per line. But why not take advantage of MBASIC's ability to handle multiple statements per line? Compactness of programming and increased execution speed make this one of the nicer features of MBASIC over older BASICs. This is a feature that is now copied by most other BASICs.

What's happening?

Line 10 defines WM$ (wormstring) as ".o" plus five graphic representations of the symbol "^" plus a "Q". (A quick glance at your graphic characters will show how the worm is built. They can be found on page 11-4 of the H/Z89 System Operator Manual.)

After WM$ is defined, the screen is cleared, line 25 is enabled, and the cursor is turned off. Then, at column 40 of the 25th line, direct cursor addressing is used to request your guess as to the fastest worm. The cursor position is then saved.

Line 20 awaits a single-key entry to tell it which worm you've selected. While you are deciding upon your guess, a delay (B) is being incremented. As soon as you hit a key, the delay is ended and your decision (1-4) is displayed on line 25. The cursor is returned to the saved position and the choice you made is stored as the variable "G".

The value of the delay (B) is the seed for MBASIC's pseudo-random generator. So the result of the WORMRACE cannot be predetermined by the player.

The FOR... NEXT... loop initializes each worm string (1-4) and prints the target and lane number at tab(56). The cursor is then returned to the saved position once again.

Line 30 selects a random number from 1 to 4 inclusive. It then adds a space at the beginning of the corresponding worm string, thereby moving that worm ahead one column on the screen. Each worm string is now printed in its respective raceway, showing the most recently advanced entrant in its new position.

The length of the worm string for the leading worm is compared to the winning length of 60. If it has not won, the random selection is again performed and the new worm is moved ahead. As soon as any worm is found to be at the target, the bell is rung, the cursor is restored, the 25th line is disabled, and the winning worm is declared.

```
10 C$=CHR$(27):WM$=".o"+C$+"F^^^^^"+C$+"GQ":PRINT C$"E"C$"x1"C$"x5"
       C$"Y8GYour Guess (1-4)  "C$"j"
20 A$=INKEY$:IF A$="" THEN B=B+1:GOTO 20 ELSE PRINT C$"l"C$"k"A$C$"Y( "C$"j":
       G=VAL(A$):RANDOMIZE B:FOR I=1 TO 4:WM$(I)=WM$:
       PRINT TAB(56)"*"I:NEXT:PRINT C$"k"
30 X=INT(4*RND(1))+1:WM$(X)=" "+WM$(X):FOR I=1 TO 4:PRINT WM$(I):NEXT:
       IF LEN(WM$(X))<60 THEN PRINT C$"k":GOTO 30
       ELSE PRINT CHR$(7)C$"y5"C$"y1"C$"Y44Worm #"X"has Won.  ";:
       IF X<>G THEN PRINT "You Lose!" ELSE PRINT "You Win!"
```

Listing 1. WORMRACE lets you choose which of four "worms" you think will win a race across the screen. MBASIC's random-number generation keeps the outcome in doubt.

Win or lose...

Your WIN or LOSE status is displayed, depending upon your choice at the start of the race.

I think you will find that cheating at the game is practically beyond any player's ability. The outcome is always a surprise and player interest is high.

Try WORMRACE as a fun game. I hope you find it an example of maximum activity with minimum programming.

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HFORTH-79 is based on figFORTH Ver 1.1 and includes the full FORTH-79 standard. Runs under the operating system file structure and uses named files for both program and data disk I/O. Includes a full screen editor, an 8080 assembler and high level constructs. (Specify CP/M, CP/M-85 or HDOS) $34.95
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Each HDOS driver listed below contains many user selectable feaures and eight combinations can be stored at one time. This allows you to change printer formats without having to reconfigure the driver each time. HDOS drivers are also available with built-in spoolers that allow you to print a file while you are using the computer for something else (for example running BASIC).
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(Each version with spooler for HDOS $39.95

UD.COM - A Universal Printer Driver for CP/M

This is a printer driver/spooler that increases the printing capability of CP/M 2.2.xx. UD.COM has capabilities similar to UD.DVD and contains a built-in spooler that queues up to four files with multiple copies and opional titles and page numbering. (Specify CP/M or CP/M-85) $39.95

SUPER SYSMOD2 - An HDOS Enhancement Program

This program modifies HDOS 2.0 to provide an expanded set of new commands and abbreviate many of the old ones. For example, MOUNT SY1: becomes M1, DISMOUNT SY1: becomes D1. New commands are added to print files, print the disk directory, change the disk label, create batch processing commands, enable the terminal scroll mode, copy files that contain hard read errors and show the free disk space. In addition, the disk directory is alphabetic, file dates remain unchanged when files are copied and a new date switch is added. Also included is a powerful file manager command which presents disk files one at a time and gives you a choice from 12 options to perform on the file. These include changing flags, viewing the first 24 lines, deleting and copying files and others. (HDOS) $29.95

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This is a dissassembler program that generated source code suitable as input to an assembler. It provides a convenient way to find out how programs work and even allows you to modify them. This program expands text and decodes operating system calls. It also inserts LABEL references (in numerical sequence) into the source code so that object files can easily be understood and relocated. (Specify HDOS, CP/M or CP/M-85) $25.00

The above products are available at most HEATHKIT stores or directly from SoftShop. Mail orders are sent postpaid by First Class Mail. Overseas orders add $3.00. Payment must be in U.S. funds. **Telephone orders are accepted.**

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ASSEMBLER CAN BE FUN

Announcing the *OMNICODER*™ Assembler

The Omnicoder™ Assembler and Linkage Editor are designed to be used by real people with real problems. The user interface is designed to keep you in control at all times. It even has an on-screen help facility. It has many sophisticated features that you would expect to find only on larger computers: program segmentation, automatic search of up to 16 drives, a true macro language with both positional and keyword parameters, global variables, unlimited nesting, and time stamping options. The linkage editor produces a linkage map to help in debugging your programs. There are many more features, too numerous to list here.

System Requirements

Z80®. 64K. CP/M®. One or two disk drives. Disk formats available: H17 (hard sector), H37 (soft sector), and H47/H67 (8-inch).

Future Plans

We plan to add multiple cpu and mnemonic capabilities. We plan to release a source code management system in early 1985, and our PANDORA™ operating system in late 1985.

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PRICE: $90 per site (USA only, no foreign orders). Ohio residents add 5.5% sales tax. MC/Visa welcome. Return undamaged within ten days for refund.
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Trademarks: Zilog: Z80®. Digital Research: CP/M®. Heath Company: HDOS™ Mockingbird Data Systems: OMNICODER™, PANDORA™.

Circle #242 on Reader Service Card

Three Products to Write Your Letters for You

Letter-template packages provide the final link in computerized correspondence.

John S. Mays

In recent years, word processors have been hailed as a boon to the business world. Just about the only complaint one hears is, "Sure, now I can process words like crazy. The problem is that I still have to *create* the words."

Well, not any more. At least, not for business letters. There are now products available that provide you with a significant portion of your business letters already created.

In this article, we will take a look at three of these products: LetterForm 1000 from PBL, Inc., in Carlsbad, California; Gold Letters from Data Base Industries in Escondido, California; and LetterBank from The Wyndham Group in Portsmouth, New Hampshire. We will investigate what they can do for you. And we will see how they compare with each other. Let's start with Gold Letters.

Gold Letters

Gold Letters is a data base of 101 business letters which you use as a data disk for your word processor. The file name of each letter is "PG" plus the page number on which the letter appears in the manual.

For example, suppose that you wished to announce a change of address. Looking through the manual, you discover that there is a sample change-of-address letter on page 94. Then, with Magic Wand on drive A: and Gold Letters in drive B:, you would call up the change-of-address letter with the command "EDIT B:PG.94". With the letter in your word processor, you could then edit it to reflect current information and your desired margins and spacings; and then print it—easy.

The 101 Gold Letters are: letters to stockholders (5); media letters (4); community activity letters (4); sales and marketing letters (9); memos (12); credit letters (8); collection letters (8); employee letters (11); personal-business letters (11); services letters (7); customer-relations letters (13); and special situations (9). These letters are very well written and should cover the majority of your letter-writing needs.

Gold Letters costs $159 and can certainly save you many hours of composition time. Additionally, Data Base Industries has announced that Gold Letters will soon contain its own "WordStar-like" word processor at no additional charge.

LetterForm 1000

LetterForm 1000 is essentially a data base of approximately 1,000 letters and forms. They are mostly for business use; but there are a significant number of personal letters, as well.

The LetterForm 1000 manual has clear instructions and is easy to use. The software loads the same way as Gold Letters and works well with both WordStar and Magic Wand word-processing programs.

At first, I was somewhat confused as to the file designation of the individual letters. But a simple CP/M DIRectory command quickly showed me that each letter's file name was the same four-digit number that accompanied each sample letter in the manual. The number is easily obtained from the listing of letters and is simple to enter. But a file name consisting of numbers does not mean much to a human—you must refer to the manual to see what the letter is about.

The letters are well written, although some are quite simple. (This is not necessarily bad!) There are 991 letters, consisting of 204 Accounting and Collection; 87 Employers and Employees; 242 General Business; 127 Goodwill and Sales; 131 Legal; 60 Order and Shipping; 89 Personal; and 51 Schools, Charities, and Organizations.

I found only one serious fault with using LetterForm 1000: due to a lack of sub-indexing, it is not easy to find just the letter that you are looking for. Take, for example, those 204 Accounting and Collection letters. That category includes: letters for accounts receivable past due (ranging from mild to serious); welcome letters to new accounts; credit-information solicitation; special-occasion letters (holiday credit terms); credit-rejection letters; and letters protesting credit rejection and/or inaccurate credit reports, changes in credit terms, wrong dollar payments, and so on. These are listed in what appears to be a random manner in the Accounting and Collection section.

The manual is indexed, and this helps somewhat. But it would be more helpful if the letters themselves were grouped according to kind. PBL does provide a printed form in the front of the manual for you to do this manually yourself. You can list the most used letters, what they're about, and where they can be found.

PBL charges only $95 for LetterForm 1000. I consider that to be a real bargain—especially since they throw in a "Writer's Reference" with many useful tables and guides to help you with your writing requirements. The Writer's Reference includes such things as abbreviations, punctuation rules, titles and forms of address, complimentary closings, parcel-shipping information, and much more.

LetterBANK

Unlike the two products discussed above, LetterBANK is not merely a data base of business letters. Rather, it is a business letter *system*. It includes both the letters themselves and a menu-

	LetterForm 1000	Gold Letters	LetterBANK
Price	$95.00	$159.00	$99.00
Number of letters	991	101	145
Quality of letters	Good	Best	Better
Documentation	Better	Good	Best
Extras	Better	Good	Best

Figure 1. A comparison of the three letter packages in terms of price, number of letters, and the author's own subjective ratings.

driven program to help you find the letter that you want.

LetterBANK also contains Courier I. This enables you to merge a text file with either data files or user input. It's a superb merge/printing package designed to merge and/or print your letters smoothly and faultlessly. You tell Courier I where the files go and that's where they'll come out, automatically justified, in the format you chose.

Courier I can also make multiple copies of a particular document. It allows for printing a series of such letters in a chain in order to produce customized form letters. It merges data files of names and addresses into letters that you've created; and it even permits other files to be inserted for special cases. You can have a file of different letterheads for different departments or different subsidiary companies.

In short, Courier I is quite handy. Of course, you can do all of this with the other products, too—but only if your word processor is capable of it.

Now, about the LetterBANK letters. Although the manual claims "over 200 letters," the appendix listing the letters consists of the following 145 letters: accounting (19); employment (30); memos (18); miscellaneous (11); personnel (20); procurement (19); and sales and promotion (28). These letters are well written and cover most business situations.

The LetterBANK manual is quite complex, as you would expect for such a powerful product. If you work your way through the sample sessions, however, you will discover that the program is easy to learn and easy to use. LetterBANK is well worth its price of $99.

Comparisons

Figure 1 compares these three products in terms of price and number of letters. It also includes my subjective

Figure 2. Samples of a letter extending credit from each of the three products.

STUART SOFTWARE
P. O. BOX 2219
RIDGECREST, CA 93555

APRIL 23, 1984

Acme Widget Works
123 Acme Place
Bigcity, Texas 12345

Dear Sir:

We are very pleased to inform you that your request for credit from Stuart Software has been granted. Our check of your references and other information on your credit application has shcwn us that you have an excellent reputation for paying bills promptly and fully.

Your new credit terms are as follows:

Credit is extended to you to a limit of $1000.00 per month.

Your credit will be accepted at the above address.

You will receive a bill telling you of the amount due every month. The amount should be paid within ten days to avoid late charges.

The supplementary charges on your account are 1.5% on the first $1000.00 and 1% over that amount.

We are certain that you will find these credit terms make your dealings with us even more convenient than they have been in the past. We thank you for your business and look forward to continuing to supply you with quality, selection, and service.

Please do not hesitate to call if you have any questions regarding your credit terms. The number is (619) 555-1234 and Sue Abbott will be handling your account.

Sincerely,

2a. Gold Letters.

LEGAL TENDERIZER

Did you file the 1040-EZ or the 1040 short form? If you plan on doing likewise year, then go ahead and turn the page; this ad isn't for you.
LEGAL TENDERIZER is the solution to classifying and tabulating your bulging shoe box full of receipts. This package won't eliminate the shoe box method for storing receipts, but when tax time rolls around, it eliminates the need to dig through it. On December 31, 19??, when the last receipt is dropped in, slam the lid on your shoe box and lock it. You're finished. All you need to do is transfer the totals to the 1040 forms before April 15. Print the expense pages to accompany your income tax forms. You say your CPA already does this for $200? Put him in the shoe box too.
Menu driven selections are Financial Statement, Expense Records, Income and Expenses, Checkbook Balancer, Bulletin Board and Special Purpose. All selections lead to functional topics. Each screen is entirely user modifiable; change them, delete them or add to them. Construct the main selections to contain any type of information utilizing the built-in editor. Easily edit the entries, total the entries and print them. Even a mini spreadsheet to perform 4 function calculations for individual line entries. (No more bragging or we might raise the price!!)
Symphonic performance with a brass band price tag and the ease of use comparable to cooking a tv dinner. You don't have to own a computer to be able to use this package. All it takes is access to one, and $40.00 to display your flagrant spending practices and lack of monetary control. LEGAL TENDERIZER is all you'll need to grab your wallets and pocket books by the straps. It better be, my name (Mike Harrold) is on it.

Order this beauty by sending a check to:
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Circle #238 on Reader Service Card

STUART SOFTWARE
P. O. BOX 2219
RIDGECREST, CA 93555

APRIL 23, 1984

Account No.: 40232-2
Limit: $1000.00

Acme Widget Works
123 Acme Place
Bigcity, Texas 12345

Dear Sir:

Please be advised that we have opened an account in your name, with a credit limit as above referenced. Please note your new account number, and please refer to it on all of your correspondence regarding this account.

Payments are due within 10 days of the statement date and are considered past due on the 20th of the month following purchase. Past due balances carried over to the following month are subject to a monthly service charge of 1.5% on the first $1000.00 and 1% over that amount.

We trust that we will always serve your account to your satisfaction and if you ever have any questions please advise.

Very truly yours,

2b. LetterForm 1000.

Acme Widget Works
123 Acme Place
Bigcity, Texas 12345

April 23, 1984

Account Number:40232-2

Dear Sir:

Stuart Software is pleased to extend you credit. Your new account number is 40232-2. Your credit line is currently established at $1000.00. Enclosed you will find information on our terms.

Thanks for choosing Stuart Software for your software needs. We're looking forward to a long and cordial business relationship with you.

Sincerely Yours,

John S. Mays
President

JSM/jsm

Enclosure

2c. LetterBANK has the option to print letters either right-justified or normal.

opinion as to the quality of the letters, the documentation, and the "extras," if any.

The quality of the letters is a matter of taste. I like the Gold Letters best; but you may prefer one of the other collections. I think you'll find that LetterForm 1000 letters tend to be a bit more "formal" in their tone, Gold Letters a bit more "conversational." In general, the three aren't significantly different in letter length.

Figure 2 illustrates a sample letter from each product on the subject of extending credit to a customer.

With all three of these products, you have control over how the letter appears on the printed page (margins and such), either through your word processor or, in the case of LetterBANK, through built-in features.

If you want help in creating your business letters, any of these products could be of use to you. Deciding which one is best depends, of course, on your needs.

If the number of letters is your sole criterion, then it's no contest—buy LetterForm 1000. If you send out a lot of form letters, and your word processor doesn't have a merge/print capability, then take a good look at LetterBANK. Finally, if you simply want a collection of well written letters which cover most business situations, Gold Letters could be your answer.

The tone of a letter is also important, though. So whatever your needs, I suggest that you first obtain copies of the manuals and look over the letters. In any case, I believe that you will get your money's worth.

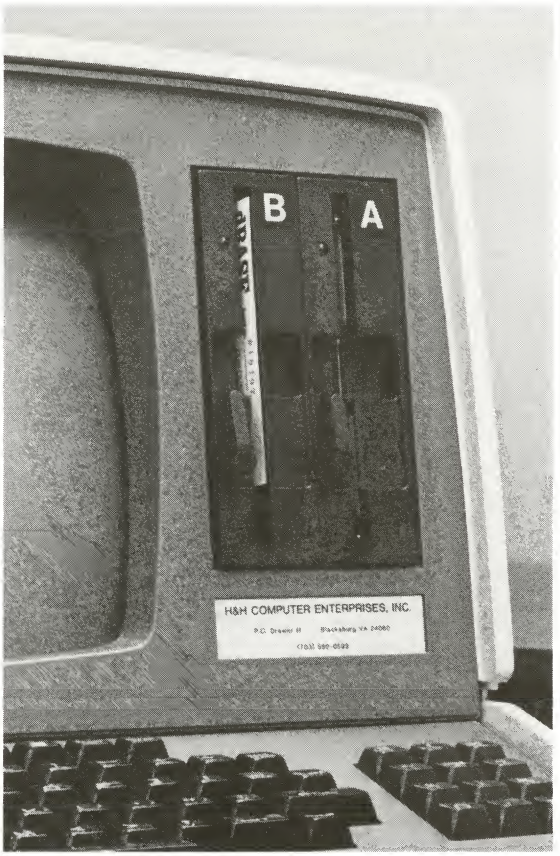
Ordering Information

LetterForm 1000, $95
Z-DOS only, requires two 5¼" disk drives
PBL Corporation
P.O. Box 559
Wayzata, MN 55391
612/473-8998

Gold Letters, $159
CP/M or Z-DOS
Data Base Industries
330 West Felicita Avenue
Escondido, CA 92025
800/922-5555

LetterBANK, $99
CP/M only, requires two 5¼" or 8" disk drives
The Wyndham Group, Ltd.
125 Mirona Road
Portsmouth, NH 03801
603/431-4800

Note: All three vendors will make every effort to accommodate your disk format, although a delay in shipping might occur.



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Software: HDOS 2.0 and MBASIC 4.82 for HDOS, or CP/M or CP/M-85/86 (Ver. 2.2) and MBASIC 5.21 for CP/M.
Order: Complete System $89† (specify hard or soft sector 5¼", HDOS or CP/M, HZ89 or HZ100). Manual alone $21.†
Master Card/Visa accepted, please include your phone number.

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Jay Gold Software
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(2) SS-89-80 for H89 & CP/M-80
(3) SS-100-85 for Z100 & CP/M-85
(4) DS-100-ZD for Z100 & Z-DOS

INTERACTION DYNAMICS SYSTEMS™
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Circle #135 on Reader Service Card

Piggyback a Parallel Port on Your '89

This parallel adapter board mounts on your serial board with no modification to the serial board itself.

Robert Shakespeare

I recently took a course through National Technical Schools which included building a Heathkit H89 computer. My later purchases included a serial input/output (I/O) board and a parallel printer.

I found out, as you may have guessed, that a parallel printer cannot be driven from a serial board.

This made me start thinking about how to make a parallel interface for my '89—an interface that could not only drive my printer but also be used for a variety of other things. It could be used to interface with electronic test equipment, for instance, or ham radio equipment. Or I could use it to drive an electric typewriter to get letter-quality printing (without paying the letter-quality price).

What I wanted was a parallel port any line of which could be used as either an input or an output. This would give me maximum flexibility to handle whatever applications I chose. (My printer, for instance, requires eight data lines and one handshaking line output from the computer, with only one handshaking line coming back. My electric typewriter, on the other hand, requires three lines for input to the computer and five lines for output.)

But now that I knew what I wanted, how was I to go about getting it?

Ever since I went to electronics school, I've loved to design things using Transistor-Transistor Logic (TTL) devices. These logic chips are very inexpensive. And using the right combination of these simple devices, it is possible to do just about anything that can be done with more complex chips.

It was time to get out the *TTL Data Book*. (This is published by Texas Instruments. If you need to find out about the particulars of various integrated-circuit (IC) chips, it's a good reference to have.)

After spending several days researching through the book and drawing up a design, I worked out something that was close to what I wanted. But the output lines were dedicated to output, and the input lines were dedicated to input. What if I had an application where I needed the lines to be changed in the middle of the program? (That would be the case when driving a programmer for an erasable programmable read-only memory—EPROM—chip.)

I could see that this design would seriously limit my flexibility. Not only that, there were so many chips that I would need to design a printed-circuit (PC) board that would take up another I/O slot in the '89. And I didn't want to add another board.

Searching for something to get around all that, I discovered the 6522 versatile interface adapter (VIA). This 40-pin chip is commonly used in microcomputers based on the 6502 central processing unit (CPU). The 6522 has two 8-bit parallel ports with handshake lines; and any line can be designated as an input or an output.

The 6522 is very easy to program and use. It includes sixteen registers: eight data registers, which contain the data which is transmitted or received; two data-direction registers, which designate whether each line is an input or an output; the peripheral-control register (PCR), which is used to control the handshake lines; the interrupt-flag register (IFR), which is used for detecting data transfers; the interrupt-enable register (IER), used to set or clear interrupt flags in the IFR; a shift register (SR), used for shifting in or out eight bits of data; and two timers which can be set to send an interrupt to the processor.

All I really wanted to use were the parallel ports and the handshake lines. And the 89's I/O slots were only capable of addressing eight registers for each chip-select line. So I decided I really didn't need the shift register or the timers; I set up my adapter to address only eight registers. These eight registers are shown in Table 1. They give me full control of both parallel ports and the handshake support functions.

(If you want to address all sixteen registers, it shouldn't be very hard to work out a method to do that. But it will not be presented in this article.)

More information on the 6522 will be presented later in this article; however, if you want to gain a fuller understanding of what this device can do, it may be a good idea to send for the R6522 data sheet from Rockwell International.

A couple of questions

When I started to design my adapter, the first thing I had to consider was how to interface this device to the '89. The interfacing was very simple and straightforward—as can be seen in the schematic in Figure 1.

There were questions, though. First, the 6522 and the '89 were incompatible concerning when data transmission takes place. The '89 transmits and receives data from its I/O ports when its system clock is in a low-to-high transition. However, the 6522 transfers data when its system clock is in a high-to-low transition. Therefore, I had to add an

Register	Address	Function
PBD	320Q	Port B data register
PADH	321Q	Port A data register with handshake
PBDD	322Q	Port B data-direction register
PADD	323Q	Port A data-direction register
PCR	324Q	Peripheral-control register
IFR	325Q	Interrupt-flag register
IER	326Q	Interrupt-enable register
PAD	327Q	Port A data register without handshake

Table 1. The registers of the 6522 which are used to control parallel-port operation on the adapter board.

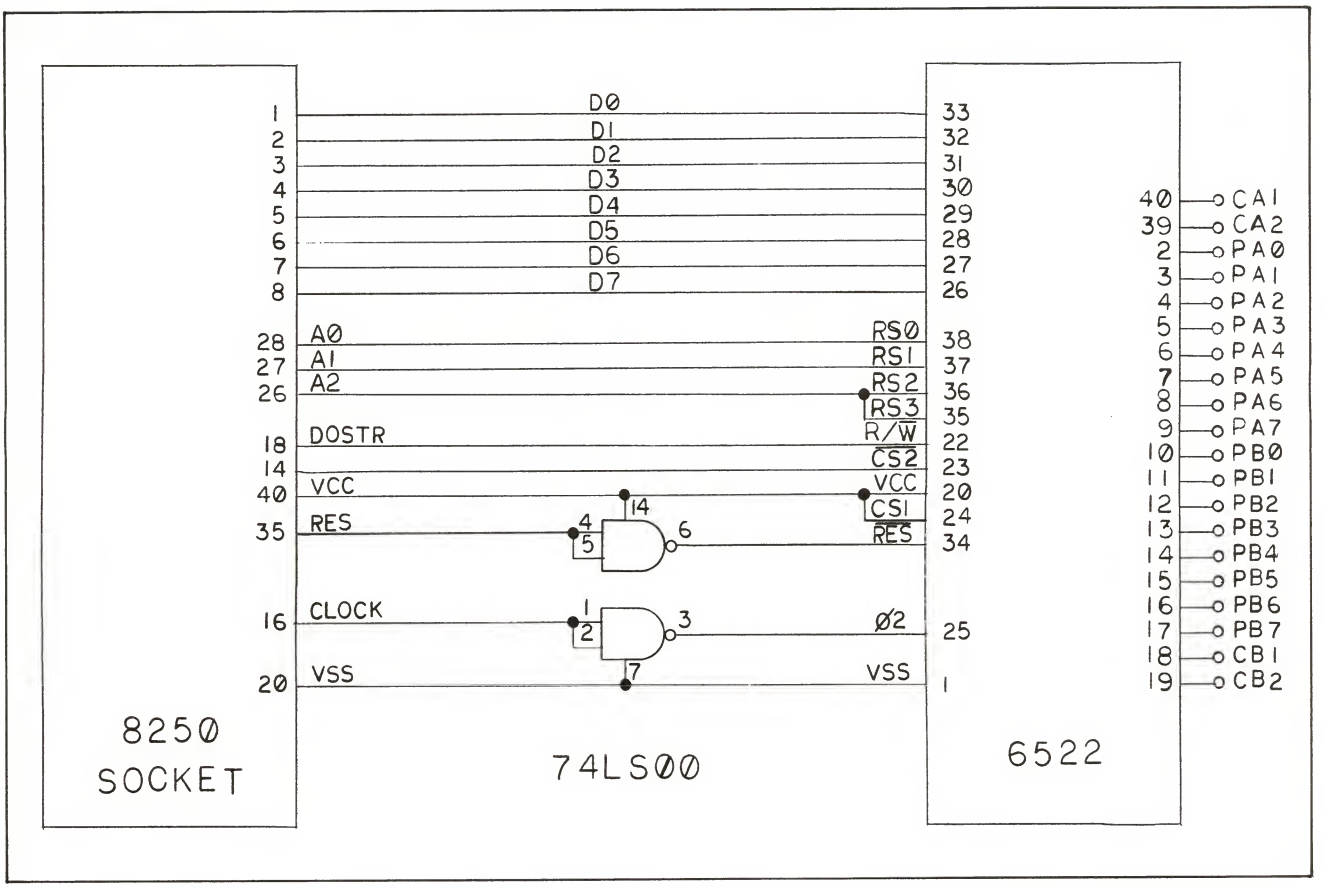

Figure 1. Schematic diagram showing the wiring between the 6522, the 74LS00, and the 8250 socket on the adapter board.

inverter (a 74LS00) to the clock line coming to the 6522.

Next there was an incompatibility with the 8250 I/O chips used on the '89's serial board. (These are the serial-to-parallel and parallel-to-serial devices used for the RS-232 ports.) The problem was that the RESET line for the 8250s on the serial board is an active high; while the 6522's RESET line requires an active low. So a second inverter section of the 74LS00 was used here.

Also, the '89 uses separate lines to control READ and WRITE for the 8250s. However, the 6522 uses a single line to control READ and WRITE. It was not immediately clear how to connect them.

This turned out to be no great problem. It was only necessary to connect the '89's WRITE (data output strobe—DOSTR) line to the 6522's READ/WRITE line. The data lines on the 6522 are in the high-impedance mode when it is not being selected by the proper signal on its chip-select line. So it will not send out any data to the data bus unless properly selected by the chip-select line. (The '89's READ-control line could be ignored since a not-WRITE is the same as a READ.)

And finally, the 8250 and the 6522 used different clock lines. This requires a wiring change, which can be made either on the serial board or on the adapter board.

General design

The next thing to figure out was how to mount this device. I considered getting a prototyping board. But at $30, it was a bit more than I cared to pay at the time. Also, I didn't want to tie up an I/O slot on the '89, since in the future I might want to add another board for an 8-inch disk-drive system.

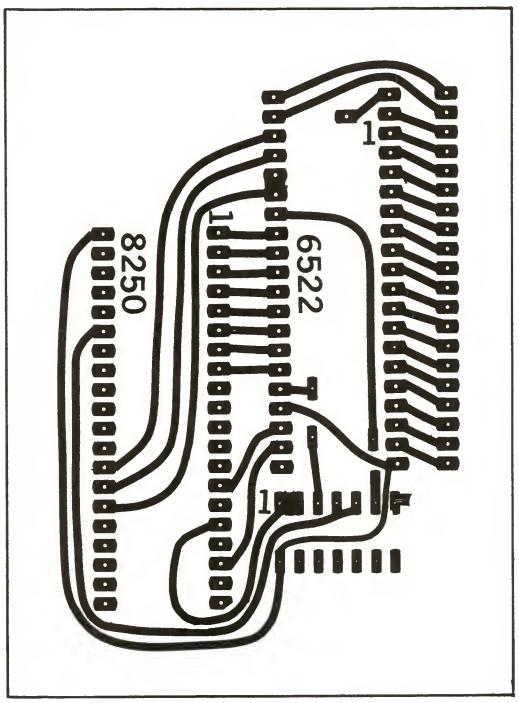

Figure 2. Camera-ready artwork for making a printed-circuit for the adapter board.

I also considered redesigning the I/O board to include two of the serial ports and the parallel port. This is what J. C. Hassall described in his article, "A Parallel Interface for the '89" in *Sextant* #1, Spring 1982. But that would involve a lot of time to develop the artwork for a printed-circuit board that size. I really wanted something simple.

The only other way to mount the 6522 was on the serial I/O board. But I couldn't just unplug an 8250 chip and replace it with the 6522. They are hardly pin-for-pin compatible.

So the idea for a small adapter board came to mind. This board would hold the 6522 and would plug into any one of the three 8250 sockets with only one modification to the serial board itself.

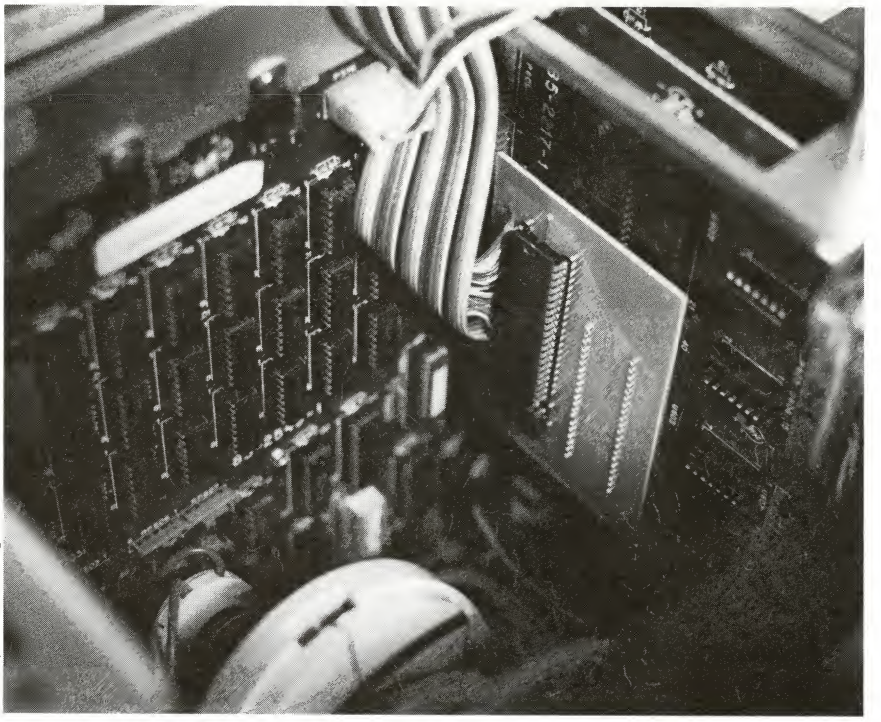

Photo by Robert Shakespeare.

Photo 1. The parallel-port adapter board can plug into one of the chip sockets on the '89's serial board.

This would allow use of one port for the 6522 and leave the other two ports for use with the 8250s.

The result is the board shown in the camera-ready artwork in Figure 2.

The way this adapter board is mounted to the serial board is fairly simple. The adapter board sits flat on the serial board as a "second storey." The connector arrangement I used to plug the board into the 8250 socket also serves as a standoff; so there is clearance between the adapter board and the chips on the serial board. You can see the adapter board in place in Photo 1.

Making a printed-circuit board

I chose to make up my own PC board for this design. I could have wire wrapped, but the resulting board would have been too awkward for the space available. And making the PC board was not very difficult.

While we frequently think of printed circuitry as a mass-production operation, there are kits available to let you make your own quite easily. You can purchase the various materials separately (as I did). But if you are just starting out, it is probably better to purchase a kit. It will provide you with the board material, developing solution, and other supplies I will mention below. (The materials list is found in Table 2.) If, however, you are a beginner to kit-building projects like this, it may be advisable to see if you can get assistance from someone experienced in making PC boards.

You can get PC board kits from GC Electronics of Rockford, Illinois. GC has two PC board kits I might suggest. The first is a Positive Acting Lift-it Kit, at $16. This kit allows you to "lift" artwork off the printed page and transfer it directly to the PC board. The second is a Positive Method Printed Circuit Kit at $20. Each kit comes with one 3" x 4" and one 4" x 6" positive pre-sensitized

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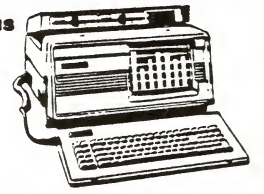

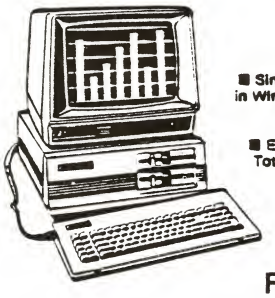

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PC board. GC offers products from a number of manufacturers, so you can also order individual supplies through them.

What you need to provide is the artwork and a sunlamp. You can either make your artwork or use the artwork in Figure 2.

Making the artwork from scratch, all I needed was rub-on transfers, drafting tape, and clear acetate. (If you have ever made up "camera-ready copy" for printing a poster or brochure using transfer type, it's basically the same process. The difference is that the transfers go on a sheet of clear acetate, rather than on a sheet of paper.)

The first step was sketching the board on paper. Then making the artwork was the second step.

For the artwork, I used Datak rub-on transfers and Bishop Graphics drafting tape on the sheet of clear acetate. The resulting artwork was a positive from which a negative could easily be produced.

The PC board material I used was from Vector (ordered through GC). This is presensitized PC board which uses positive artwork; so I did not need to make a negative.

For the board material, I suggest you purchase Vector's G-10 glass material. For mounting the IC socket pins discussed later, it works a lot better than the phenolic material that is also available.

qty	item	supplier	cost per unit
1	6522A 2MHz	JDR Microdevices	$9.95
1	74LS00	JDR Microdevices	$ .24
3	40-pin sockets	Samtec	$2.45
1	14-pin socket	JDR Microdevices	$ .15
1	ribbon cable	Radio Shack #278–772	$3.59
1	connector, female	Radio Shack #276–1565	$4.99
1	PC-board kit	GC Electronics	$16–$20

Table 2. Materials list. A PC-board kit from GC Electronics will come with the board material, developing solution, and ferric chloride mentioned in the article. These may also be purchased individually from GC; and boards from Vector Electronics. If camera-ready artwork for the board is made from scratch, Datek rub-on transfers, Bishop drafting tape, and clear acetate may be purchased in drafting- and artist-supply stores.

Place the artwork directly on the board. The tape side should be facing away from the board and toward the sunlamp. Exposure time is ten minutes when the board is placed ten inches from the sunlamp.

After exposure, the board is placed in the developing solution and the exposed emulsion is washed away. The board is then rinsed and allowed to dry. (If you are in a hurry, a blow dryer may be used to dry the board; but don't use high heat or damage may result.)

Next, place the dry board into a solution of ferric chloride. The remaining emulsion protects the unexposed copper surface of the board—the circuitry, labels, etc. So the ferric chloride etches away all the exposed copper—leaving you with your PC board so you can move on to actual construction.

A warning

Remember: The 6522 is a metal-oxide semiconductor (MOS) device—and the proper precautions must be taken when handling it. There is always the possibility of damage due to electro-static discharge. It should be kept in conductive foam until it is necessary to plug it into the board.

It would be a good idea to handle the 6522 only while you are grounded to a table with a *metal* working surface. If you don't have a metal table to work on, you could do what I did. So you won't build up a static charge, take your shoes and socks off; let your bare feet feel the thick shag carpeting (or cold floor) under your workbench.

Construction

The construction of the adapter board takes place in basically three steps. (The parts are listed in Table 2.) First, we are going to put in IC-socket pins. (On the underside of the board, the pins connect to the printed circuitry and go into a 40-pin socket that serves as both standoff and connector to the 8250 socket on the serial board.) Next, we have to put in sockets on the top of the adapter board (for the 6522 and the 74LS00 inverter chip). Finally, we can make up a short connecting cable to go from the adapter board to the rear panel of the computer.

So, after the PC board is completed, drill the board for the sockets. Use a #53 drill for the 8250 socket and a #66 drill for the 6522 and 74LS00 sockets. For drilling the board, try to use a drill capable of at least 10,000 r.p.m. (such as a Dremel).

Next you need those socket pins. Remove all the pins from a 40-pin IC socket (Samtec ICO-640-SGT or equivalent). The pins of this type have a round female end to hold the pins of the IC (as opposed to a flat pin just bent into shape). I used a pair of diagonal cutters to cut the plastic from around the pins and removed the pins undamaged.

Insert these pins into the holes on the

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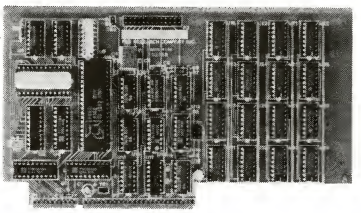

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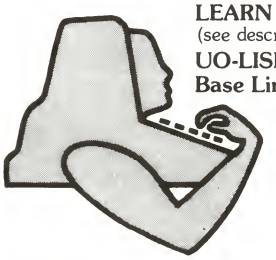

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8250 half of the adapter board. The pins should just fit through with a little bit of force. They'll have a good mechanical hold because of the flanges on the pin. Then solder the pins to the pads to ensure a good electrical connection.

Next, mount the board onto a second 40-pin socket. This is for the protection of the pins that were inserted into the board. It will also give the adapter board some clearance off the serial board so it will clear the adjacent ICs.

Standard IC sockets were used to hold the 6522 and the 74LS00.

I used 25-conductor 26-gauge stranded ribbon cable to connect the adapter board to a DB-25F connector mounted in the center I/O hole in the rear panel. I placed the adapter board on the middle 8250 socket on the I/O board; so the DB-25F connector was placed in the 320Q hole.

(It may be a good idea to use some other kind of connector than the DB-25F. Both the DB-25F and the RS-232 connector are the same. So it is possible to plug in an RS-232 line to the 6522 by accident, possibly damaging the 6522.)

On my serial board, the 8250 socket that I had would not hold the adapter board securely enough; so I replaced it with one of the Samtec sockets. I should note, though, that I purchased my serial board blank from the Heath parts department. And I mounted my own parts on it—which included cheap IC sockets. I have since installed the adapter board into a serial board built by Heath. And I have had no problems with the Heath socket holding it.

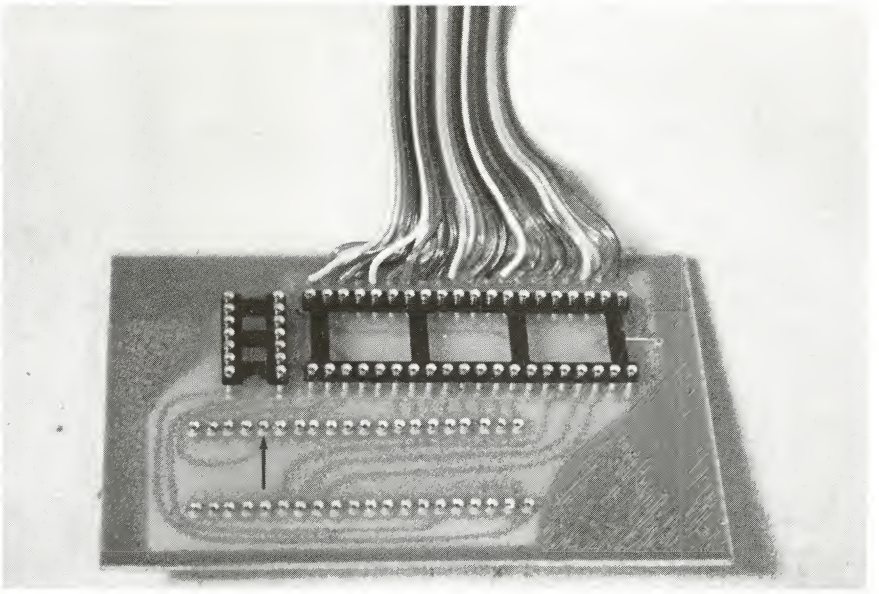


Photo by Robert Shakespeare.

Photo 2. The adapter board and cable. The cable goes to the '89's rear panel. The socket for the 6522 versatile interface adapter (VIA) chip is at the top right; the 74LS00 inverter chip plugs in immediately to the left. Behind the lower half of the adapter, there is a socket to connect the adapter to an 8250 socket on the '89's serial board. As discussed in the text, you may want to cut one of the pins from the adapter board's socket connector where it plugs into the serial board. Then a wire carrying the clock signal can be plugged into the socket pin on the 8250 half of the board (arrow).

Hooking up the clock

As mentioned earlier, the clock used to drive the 8250 and the system clock are different. The 8250 uses a 1.8432 megahertz clock which is generated separately from the system clock (which is 2.048 MHz).

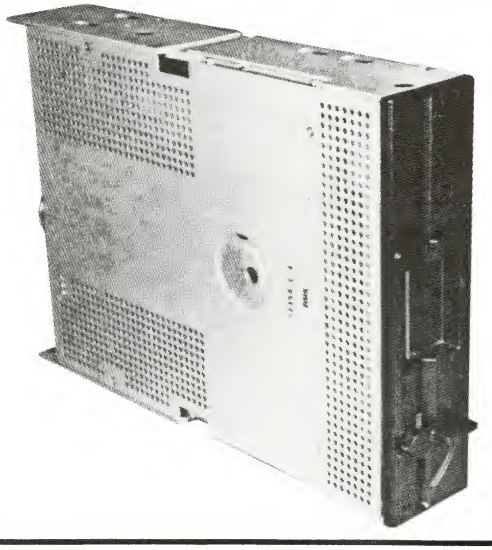
The 6522, however, requires the system clock (in our case the '89's system clock) to drive its functions. So we have to cut the connection that would bring the 8250 clock into the 6522. Then connect the 6522 to the '89's system clock.

If you do not mind making a change to your serial board, you can cut the foil at pin 16 of the center 8250 socket on the I/O board. Then run a suitable length of #30 wire-wrap wire from pin 16 of the 8250 socket to pin 13 of the 25-pin edge connector.

You may, however, wish to avoid making any changes to the serial board. (They are easier to make than to unmake!) If so, the change can be made on the adapter board's socket connector. First, cut off pin 16 on the socket connector. The pin should not be cut off entirely—just that part that inserts into the 8250 socket on the serial board. Then run a #26 solid jumper wire from pin 13 of the edge connector to the top of the adapter board; then just plug it into the socket for the pin you just cut on the connector. (See Photo 2.)

Electrical checkout

Prior to mounting the adapter board on the serial board, I carefully checked and double-checked for shorts, opens, and other annoying things that could have a destructive effect on the board or the computer. The adapter board was



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mounted on the serial board and the connector was then mounted on the rear panel in the 320Q hole.

The next step is electrical checkout. Upon power-up, the lines of the 6522 will be in the input mode; and if they are checked with a voltmeter, they will appear high (3 to 5 volts DC). Table 1 lists the 6522's registers that are used in this design.

By writing a one to any bit in either of the data direction registers (PADD for Port A and PBDD for Port B), the line that corresponds to that bit will become an output line.

I found the best way to get familiar with the operation of the 6522 was to write a program that would read all eight registers, then would accept my input in the form of register address and data to go there. The data on the screen would change according to my input. After checking the screen, I would check the port lines with a voltmeter to make sure the register had received the data properly. A suggested BASIC program for checkout can be found in Listing 1.

In Listing 1, lines 10 through 40 read the registers of the 6522 and display the result on screen. The eight registers have addresses from 320 octal (Q) to 327Q.

Line 50 requests input for a register and data for that register. Line 60 sends the data to the selected register. R must be an integer in the range of 208 to 215 (320Q to 327Q). D must also be an integer value (in this case, from 0 to 255). The numbers that appear across the screen will be the value of each register.

For example, let's enter 210,255. Since 210 = 322Q, this indicates we're going to Port B data-direction register (PBDD); and since 255 = 11111111 binary, we are sending all ones. Then when the registers are read again, the register for PBDD will read 255.

Also, the Port B data register (PBD) will read 00. (This is assuming no data has been written to PBD prior to its being changed from an input to an output.) By sending ones to PBDD, we have just made PBD an output; and the value placed in PBD can be read back at any time. Checking PBD's lines with a voltmeter will show all the lines are low.

Send data to 208 (PBD), toggle one line at a time, and follow it with a voltmeter. For example, typing in 208,01 will cause Port B line 0 (PB0) to go to a high state. 208,02 would cause PB1 to go to a high state, and PB0 would go back to a low state.

```
10 FOR I=208 TO 215:REM 320Q TO 327Q
20 PRINT INP(I);
30 NEXT I
40 PRINT
50 INPUT R,D
60 OUT R,D
70 GOTO 10
80 END
```

Listing 1. A BASIC program to read the registers of the 6522 and display the results.

Using the 6522 with a printer

Using the 6522 with a parallel printer is really quite simple once you understand what is happening.

The first thing you must do is initialize the 6522.

When the 6522 is reset, which happens on power-up or when you press SHIFT/RESET, all the lines are set to the INPUT mode. In order to set these lines to outputs, the data in the Port A or the Port B data-direction register (PADD or PBDD) must be changed. A 1 sent to a bit in PADD or PBDD will make the corresponding bit in the data register (PAD or PBD) an output. Eight data lines are used in the cable for a parallel printer; so all lines must be made outputs. Ones are sent to the data-direction register by sending a $FF (hex FF, octal 377, decimal 255, binary 11111111).

Next, handshaking must be set up. On a Centronics-type parallel printer port, there are typically two handshaking lines. One is used for the computer to tell the printer there is data available (data ready or data strobe) at the data lines. The other one is for the printer to tell the computer it has received the data (data acknowledge).

It may work better with some printers to rely on their BUSY line rather than the data-acknowledge line. If your printer buffer fills up, the BUSY line can tell the computer—while the data-acknowledge line may just keep on acknowledging data. (Consult your printer manual for more specific details.)

We can use Port B for an example of the handshaking lines. The data-ready (data strobe NOT) signal expected by a Centronics-type printer to indicate data is available is a high-to-low transition. Usually the line will be set in a high state (since a low indicates to the printer that data is available). In order to set it high, a 100 (binary) must be sent to bits 7, 6, and 5 of the peripheral-control register (PCR).

The printer's data-acknowledge signal is a low-to-high transition. A 1 must be sent to bit 4 of the PCR. *Note*: Port B handshake is controlled by the upper four bits of the PCR while Port A handshake is controlled by the lower four bits of the PCR. So what must be sent to the PCR is a $B0 hex (10110000 binary). CB1 and CB2 are the 6522's handshaking lines. CB1 will be used as the data-acknowledge line and CB2 will be used as the data-ready line. For port initialization, refer to the printer driver software under START in Listing 2, VIAPATCH.ASM.

To output the data, the printer must be checked to find out whether it is busy or ready to receive data. Bit 4 of the interrupt-flag register (IFR) is checked to see whether it has been set by an active transition of the data-acknowledge line. If it has been set, there will be a 1 in the register. Once the 1 has been detected, the routine will send the data to the PBD. When data has been written into the port, then the flag in bit 4 will be cleared. Then it will await another data acknowledge from the printer.

On my printer, I use the BUSY line and initialize PCR with $A0 (10100000). You may wish to do the same thing. VIAPATCH.ASM is set up for using the BUSY line.

Patching CP/M by hand

To use the parallel port with the

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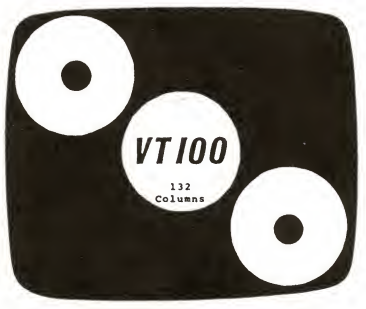

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CP/M operating system, I have used two methods to drive the printer.

The first one is to modify CP/M's Basic Input/Output System (BIOS). The BIOS is used to tell CP/M how to handle your specific computer.

The BIOS assembly listing is 55K in size. If you want to modify it to drive the 6522, you may need at least twice that much room on your disk. (That depends on whether your editor or word-processor takes up extra disk space for backup, housekeeping, etc.)

If you have enough room on your disk and you wish to modify the BIOS listing, this is how you would go about it. First find in the listing the output-status routine for the printer. It will be listed under LPTOS:. Replace it with the following:

```
LPTOS:  IN   IFR
        ANI  010H
        RET
IFR     EQU  0D5H
```

Now find the printer-output routine LPTOUT: and replace it with the following:

```
LPTOUT: IN   IFR
        ANI  010H
LPTOU1: JZ   LPTOUT
        MOV  A,C
        OUT  PBD
        RET
PBD     EQU  0D0H
```

The I/O port-initialization routine is located toward the end of the BIOS listing. Between the labels CBT1: and CBOOT1: find the two lines:

```
CALL    IN8250
LXI     H,SMSG0
```

Between those lines, insert the following:

```
VIAINT: MVI  A,0FFH
        OUT  PBDD
        MVI  A,0B0H
        OUT  PCR
        XRA  A
        OUT  PBD
PBDD    EQU  0D2H
PCR     EQU  0D4H
```

(The line MVI A,0B0H is written on the assumption you will use the data-acknowledge line. If you wish to use the BUSY line, use 0A0H instead of 0B0H.)

VIAPATCH for CP/M

The second method is easier than modifying the BIOS. It simply uses the program VIAPATCH (found in Listing 2) to do the job. The comments in Listing 2 describe how to set up VIAPATCH.ASM using CP/M's CONFIGUR.

Upon a cold boot, the Automatic Command Line (which is an option in CONFIGUR) calls VIAPATCH.COM from the disk, then automatically loads and runs it. The program will initialize the 6522 and load the necessary routines to operate it into the BIOS. VIAPATCH uses the I/O jump table located at the beginning of the BIOS routine. So this routine can patch any BIOS, even if it is specialized (for different disk drives, etc.).

If your printer is the type that will accept alternate character sets (French, German, etc.) or several different styles of print or different formats, it is possible to add supporting code to VIAPATCH. The VIAPATCH listing indicates where to insert a transfer routine. Then you can transfer a data table to the printer. It

Listing 2. VIAPATCH initializes CP/M for use with the adapter board. CP/M's CONFIGUR can enable you to have VIAPATCH loaded and run automatically upon boot-up.

```
;*******************************************************
;***                                                 ***
;***                  VIAPATCH.ASM                   ***
;***                                                 ***
;*******************************************************
;
;THIS PROGRAM IS USED TO INSERT THE ROUTINES REQUIRED
;TO OPERATE THE 6522 INTO THE BIOS AREAS THAT ARE USED
;TO OPERATE THE SERIAL PRINTER.  THE ROUTINES INITIALIZE
;THE 6522 AND DRIVE A PARALLEL PRINTER.
;
;TO USE THE PROGRAM, USE THE ASSEMBLER SUPPLIED WITH THE
;CP/M AND MAKE A .COM FILE AS DISCRIBED IN THE CP/M
;MANUAL.  TRANSFER VIAPATCH.COM TO YOUR SYSTEM DISK.
;USE CONFIGUR AND SET THE 'RUN AUTOMATIC COMMAND LINE ON
;COLD BOOT' TO TRUE.  NEXT SET THE 'AUTOMATIC COMMAND LINE'
;TO VIAPATCH.  THE PROGRAM WILL NOW BE RUN AUTOMATICALLY
;UPON A COLD BOOT
;
;VIA IS CONNECTED TO THE PRINTER AS FOLLOWS:
;
;     VIA    PRINTER
;    PB0 10      2       D0
;    PB1 11      3       D1
;    PB2 12      4       D2
;    PB3 13      5       D3
;    PB4 14      6       D4
;    PB5 15      7       D5
;    PB6 16      8       D6                              →
```

```
;   PB7 17      9       D7
;   CB1 18     11       BUSY
;   CB2 19      1       DATA STROBE NOT
;   GND  1     14       GROUND
;
PBD     EQU     0D0H            ;PORT B
PADH    EQU     0D1H            ;PORT A W/HANDSHAKE
PBDD    EQU     0D2H            ;PORT B DATA DIRECTION
PADD    EQU     0D3H            ;PORT A DATA DIRECTION
PCR     EQU     0D4H            ;PERIPHERAL CONTROL REGISTER
IFR     EQU     0D5H            ;INTERRUPT FLAG REGISTER
IER     EQU     0D6H            ;INTERRUPT ENABLE REGISTER
PAD     EQU     0D7H            ;PORT A W/O HANDSHAKE
        ORG     0100H           ;ORIGIN 0100H
START:  MVI     A,0FFH          ;INITIALIZE PORTS
        OUT     PBDD            ;SET PORT B TO OUTPUTS
        MVI     A,0A0H          ;BUSY - 0B0H FOR DATA ACK
        OUT     IER             ;SET UP HANDSHAKE REGISTER
        XRA     A               ;ZERO ACC.
        OUT     PBD             ;SEND NULL CHARACTER
;
;                       INSERT CODE HERE FOR TRANSFERRING
;                       ANY SPECIALIZED CODE TO MAKE ALTERNATIVE
;                       CHARACTER SETS.
;
        LHLD    001H            ;LOAD HL W/ ENTRY POINT TABLE ADD.
        MVI     A,02BH          ;OFFSET FOR LISTST: BRANCH TABLE
        CALL    PCHAD           ;GET ADD OF LISTST: BRANCH TABLE
        MVI     A,0CH           ;OFFSET FOR LPTOS: ROUTINE
        CALL    PCHAD           ;GET ADD OF LPTOS: ROUTINE
        SHLD    PTROUT+1        ;STORE IN PTROUT ROUTINE
        XCHG                    ;MOVE HL TO DE
        LXI     H,PTROS
        CALL    MOVIT           ;MOVE ROUTINE
        LHLD    001H            ;LOAD H&L W/ ENTRY POINT TABLE ADD.
        MVI     A,0DH           ;OFFSET FOR LIST: BRANCH TABLE
        CALL    PCHAD           ;GET ADD OF LIST: BRANCH TABLE
        MVI     A,0CH           ;OFFSET FOR LPT: ROUTINE
        CALL    PCHAD           ;GET ADD OF LPT: ROUTINE
        SHLD    PTR1+1          ;STORE IN PTROUT ROUTINE
        XCHG                    ;MOV HL TO DE
        LXI     H,PTROUT
        CALL    MOVIT           ;MOVE ROUTINE
        RET
PCHAD:  CALL    DADA            ;GO DO (H,L)+(A)
        MOV     A,M             ;MOVE LOW BYTE ADD TO A
        STA     TADD            ;STORE
        INR     L               ;INCREMENT POINTER
        MOV     A,M             ;MOVE HIGH BYTE ADD TO A
        STA     TADD+1          ;STORE
        LHLD    TADD            ;LOAD NEW ADDRESS POINTER
        RET
DADA:   ADD     L               ;ADD L TO A
        MOV     L,A             ;MOVE A TO L
        RNC                     ;RETURN IF NO CARRY
        INR     H               ;INCREMENT H IF CARRY
        RET                     ;RETURN
MOVIT:  MOV     A,M             ;MOVE ONE BYTE FROM THIS ROUTINE
        STAX    D               ;STORE IN BIOS AREA
        INX     H               ;INCREMENT POINTER
        INX     D               ;INCREMENT OTHER POINTER
        ORA     A               ;SET FLAGS
        JNZ     MOVIT           ;IF NOT NOP CONTINUE
        RET                     ;RETURN
PTROS:  IN      IFR             ;INPUT INTERRUPT FLAGS
        ANI     010H            ;MASK FOR PROPER FLAG
        RET                     ;RETURN
        NOP
PTROUT: CALL    PTROS           ;CHECK FLAG STATUS
        ORA     A
PTR1:   JZ      PTROUT          ;IF 0 CHECK AGAIN
        MOV     A,C             ;MOVE CHARACTER TO ACC
        OUT     PBD             ;SEND THE CHARACTER
        RET                     ;RETURN
        NOP
TADD:   DS      2               ;SPACE FOR ADDRESS POINTER
;                       TABLE FOR FANCY PRINT FORMATS GOES HERE
        END     START
```

would contain your own personal character set or any other fancy format you wished.

Connect the printer to the 6522, connecting PB0-PB7 to D0-D7 respectively, CB1 to the BUSY line, and CB2 to the Data Ready (Data Strobe NOT) line.

I have found this set of parallel ports very handy with several home-made devices which include an EPROM programmer interface and an IBM Selectric typewriter. One of my future projects will include interfacing it with a voltmeter and with an Olivetti Praxis 35 portable typewriter. With a little imagination, it could be used to control ham equipment, lighting equipment, or even Heathkit's weather station. *Enjoy!*

Ordering Information

R6522 data sheet, no charge.
Rockwell International
Electronic Devices Division
P.O. Box C
Newport Beach, CA 92660
814/833-4700, 800/854-8099 (outside California)
800/422-4230 (inside California)

Positive Acting Lift-it Kit (Cat. # 22-316), $16.
Positive Method Printed Circuit Kit (Cat. # 22-310), $20.
GC Electronics
400 South Wyman Street
Rockford, IL 61101
815/968-9661

40-pin IC sockets, part # ICO-640-SGT, $2.45 each.
14-pin socket, part # ICO-314-SGT.
Samtec
810 Progress Boulevard
New Albany, IN 47150
812/944-6733
(It would be best to contact Samtec and find out who your local distributor is; then get the sockets from them.)

6" x 4" single-sided positive sensitized glass PC board, package of three (part # CU07R45W1), $16.09.
Vector Electronic Company
12460 Gladstone Avenue
P.O. Box 4336
Sylmar, CA 91342-0336
818/365-9661

6522A Versatile Interface Adapter (2 MHz), $9.95.
74LS00 inverter, $ .24.
14-pin soldertail IC socket, $ .15.
JDR Microdevices
1224 South Bascom Avenue
San Jose, CA 95128
408/995-5430
(Minimum order, $10; add $2.50 shipping and handling for UPS Ground, $3.50 for UPS Air. California residents add 6% tax; Bay Area and Los Angeles, 6½%.)

Classified Ads

Hardware

5 MEG HARD DISK SUBSYSTEM for H89/90, $1,500 complete. Kits from $800. Digital Search, 103 South Main Street, Greer, SC 29651, 803/877–9444.

HA-8-3 COLOR GRAPHICS BOARD, $199 postpaid, check or money order. New, unopened. Jim Nielsen, 2712 West Aberdeen Drive, Montgomery, AL 36116, 205/272–5591.

Z100, FULLY LOADED, software, technical manuals. $2,195. George Tucker, 11615 Mississippi, Los Angeles, CA 90025, 213/473–7691.

Software

FLOPPY DISKS and other supplies at Discount Prices. Call 212/652–2053, 7 to 11 p.m. Eastern time. MATCOMM, POB 604, Bronx, New York 10469.

Publications

SCHULTZ'S BIMONTHLY reports best bargains: microcomputers, peripherals, applications, supplies. $9.95 single, $39.80 yearly postpaid, guaranteed. Postroad, Box 1212-D, Roanoke, VA 24006.

To get in touch with your fellow Heath/Zenith users, place your short notice in *Sextant*'s classified section. The rate is only 75¢ per word with a minimum of 15 words. Send your typewritten ad and payment to: Sextant, Classified Ad Department, 716 E Street S.E., Washington, DC 20003. (Please include your name and telephone number for our records.) We need to receive ads for the January-February 1985 issue by November 9, and for the March-April issue by January 11. If you have any questions, contact Bryan Rutberg at 202/544–2868.

Coming up in *Sextant*:

- a look at how some people are using Heath/Zenith computers in research and development
- a review of WISE's 2S+2P+RTC board for the H/Z89
- a review of S&K Technology's WatchWord word processor for the Z100
- a command processor program for HDOS
- a review of TMSI's H1000 16-bit upgrade for the H/Z89
- a review of Microsoft Word for the Z150/160
- some BASIC programming tips
- a review of Redding Associates' Graftalk business graphics program for the Z100 and Z150

Luminaries

Kurt Albrecht is in his first year at Drexel University, majoring in Electrical and Computer Engineering. He started programming when he was in eighth grade—in assembly language on a TI-59 programmable calculator! He does a lot of freelance programming, and wrote INPUT.BAS when he needed to screen out bad input to a small business catalogue program he was writing.

Raymond Dotson gets more mileage out of a few lines of programming than anyone else we know.

Sidney Hack retired as a Colonel in 1974. He was head of the Department of Military Planning and Strategy at the U.S. Army War College. (This must be where he learned the negotiating skills he applies to Z-BASIC.) He devotes himself mostly to writing programs and articles for and about various microcomputers. His interest in computers dates from an earlier assignment that involved computer-assisted war games.

Robert A. Hinnard owns and operates a tool and die machine shop. His expertise in the machine and sheet metal industry allowed him to design and fabricate new cabinets for his H8 and disk drives. An active member of the Pomona Heath Users' Group, he's written for their newsletter, and is one of the SYStem OPerators for their bulletin board.

Stan Lockhart is a Specialist-6 Computer Programmer/Analyst with the U.S. Army. He's part of a computer-inspection team that visits installations in every corner of the world. His wife and four children all use the H89 in one way or another—"even my six-year-old!" It's no wonder that he needs an explicit error-message routine.

John S. Mays is a retired Marine Corps officer employed as an operations research analyst for a large computer-services company. His software firm, Stuart Software, developed several decision support software packages (now sold by Generic Software of Marquette, MI). Perhaps he's used one of them to decide which letter-template package to use for his business correspondence.

Stephen C. Noeller, when he's not drawing cartoons, is an electronics technician in the Air Force. With that background, he might be well advised to go inside his HERO and disconnect some wires.

Michael N. Rhoads is an industrial-controls engineer for a linear induction motor drive engineering company in Michigan. He started out on an H8, both at work and at home. When he moved up to the Z100, he came up with the file-transfer routine presented in this issue. The H8 is "pretty much in [his 12-year-old son's] hands now."

Robert Shakespeare is a design engineer for Sarton Electronics in Florida. Most of the equipment he designs is computer-controlled test equipment for their products. With that background, designing a second-storey parallel port must have been a breeze.

William Tavolga is a retired professor of biology and psychology. Although he keeps himself busy enough as a research scientist, it's nice to know he still makes time for teaching.

File Naming Conventions

Let your asterisks do the walking.

John Walker

The nice thing about 8" disks and Winchester hard disks is all the files you can get on them. A single 8" floppy disk can hold as much as one megabyte of data. You can get as much as 10 MB on the hard disks offered with Heath/Zenith's H/Z110, '120, and '150 computers. Compare that to the 300K on the standard 5¼" hard-sectored disk running on the H8 or H/Z89.

But compare the length of a directory on one of those disks with what you get on a 5¼" disk.

With a Winchester drive, it's not uncommon to get more than a screenful of files. You're well advised to get one of those programs that will alphabetize your directory, and display in 20-line chunks rather than spewing it out all at once.

But you can get a lot of the benefits of these products by some thought and planning on your own—and by using the wildcards (* and ?) recognized by the directory command—CATalog or DIR under the Heath Disk Operating System (HDOS); DIR under CP/M and under the Zenith Disk Operating System (Z-DOS).

You can benefit even if you have only a single 5¼" drive. And into the bargain, you can sneak in a lot of file backup, too.

Different disks for different files

For users of floppy disks, the first step to good organization is obvious: store similar files on the same disks. You probably already do that: games on this disk, correspondence on that disk, financial information on another, and so on.

That's obvious, true, but we've all forgotten about it from time to time. When you start out with just a few files and a few disks, after all, it's no problem that files are just sort of scattered around. And when disk space is in short supply, we put things wherever they fit. It's easy to fall into bad habits.

Different names, too

But file *naming* can be just as important as file *storage*. And here, too, we slip into bad habits. We start out with just a few game files, say, or BASIC programs. So we give files names like GAME.BAS.

Well, games, at least, quickly get better names—we have too many of them to get away with an uninformative name! But when we only have a few of something, it's back to a vague file name. *Sextant* authors seem to like the name ARTICLE.TXT. Helpful maybe when you only have one article—but what do you do when you have fifty or so?

The first thing you do is to give each file a name as individualized as you'd give to a game. ARTICLE.TXT becomes, say, SOP13.JW—the "Standard Operating Procedure" article for issue #13, by an author whose initials are J. W.

When things really get complicated, a file-naming convention comes in handy.

Well, that's pretty good, but what if I'm writing ten or twenty articles at a time?

First of all, even if I'm just writing one article, I'm not going to feel comfortable if that article sits on just one file on one disk. I've seen enough files mangled to be paranoid. So, if I'm a good little boy, I'll do a periodic disk backup. (For that, you might want to take a look at Dean Gibson's "Standard Operating Procedure" on "Disk and File Management" in *Sextant* #9, March-April 1984.)

Well, I'm also lazy. So, before I do a disk backup, I do a file backup. In fact, I can do a file backup every time I work on the article. SOP13.JW becomes SOP13A.JW. And when I file it away after working on it, I'll name the later version SOP13B. My word processor, EDIT19, will tack on the extension .JW automatically. So for an extra six keystrokes, I have my file backup. (Besides, I make a lot of changes and deletions. So it's nice to have the old stuff available for easy salvage.)

*The wildcards: * and ?*

Now I can start using my directory more efficiently—by using * and ?. In a CATalog (DIRectory under CP/M) or COPY command, the * means "everything." So CAT DK1:*.JW will show me all the articles I'm working on. The ? means "anything in this spot." So CAT DK1:SOP13?.JW will give me all the versions of this article.

But can I use the * and ? to do more of my work for me? For instance, do I have to break up an article for any reason? (Maybe it's just huge, a whole book almost.) Then SOP13A gets renamed SOP131A, SOP132A, etc. Then a CAT DK1:SOP13?A.JW gives me all the "A" versions, SOP13?B, all the "B" versions, etc. CAT DK1:SOP13?A.JW shows me how many sections the "A" version is broken into, and so on.

But I said I might be working on fifty articles. Not true, but the problem is still there if I'm working on a large number of vaguely similar types of files. Let's take the letters I write to authors as *Sextant*'s technical editor—I might have a mess of them to write. (Apologies for tardy replies, by the way. Feel free to write and check up on things.)

For letters, I happen to prefix every name with the letter "L". Not very imaginative, but it works. All I have do is ask for a CAT L*.JW and I get all my letters.

For the rest of the file name, I choose the first three or four letters of the recipient's last names. A letter to Jennie Allen would have the file name LALL. The extension? Well, it *could* be just .JW, but I may be working on more than one series of letters at the same time. So when I start out on a new disk, the extension would be .AJW. The next series would get .BJW, .CJW thereafter, and so on. So the CAT would be for L*.?JW.

I have a command file, a macro, under EDIT19 that strips the name and address from a letter and moves it so that when I print it, it will be centered on the envelope. To name the file holding this address, the EDIT19 macro just tacks on an "A" to the beginning of the file name. ALALL would indicate it's the envelope address for letter LALL.

You can see that this can get pretty

detailed if you want. Using up the first one or two characters in a file name for "category identification" still leaves you with up to six characters for the unique name. And those first two characters give you 26-squared possible combinations for the file's category.

Most of us don't need to make so many distinctions. But what about a small business where four or five people share a Winchester (or a mess of 8" disks)? Then C might be the first letter for letters to customers, V for letters to vendors, etc. If you don't have overlapping series of letters, one letter of the extension might be the category, the other two the initials of the writer. When things really get complicated, a file-naming convention comes in handy.

Printing

But even without lots of files to keep track of, the convention makes printing letters easier. Our printer is a few feet away from the computer. Do I want to copy each letter individually, walking back and forth each time? No, I do not.

Instead, I ask for a CAT DK1:L*.NJW, for series "N" letters. Then, I just COPY LP:=DK1:L*.NJW. At the end of each letter, the computer pauses just long enough for me to take the printer off-line. Trade paper. On-line. Do it all over.

(A note, though: this depends on the speed of your computer, printer-driver software, and printer. There's just enough time with our H8, ATH44 driver, a Spinwriter rated at 55 characters per second (c.p.s.), and a communications speed of 1200 baud. Things are going too fast, though, when I use the H25 printer (150 c.p.s. and 9600 baud).

COPY LP:=AL*.NJW then gives me the envelope addresses. Do you use mailing labels? Then have the appropriate number of carriage returns at the end of each file and it's all automatic. (It's not as automatic and spiffy as form-feed envelopes and giant programs that do all the address grabbing automatically. But it's a *lot* cheaper.)

There's another way I use the * and ?. Writers send in programs to be tested and I prefer to keep the .BAS or .ASM extension. So I'll prefix their initials to the program name. Then I can do a CAT for all .BAS programs of author X. Y. Z.—CAT XYZ*.BAS.

Finally, I can combine files on disk by the same method. COPY DK1:CORRESA.-NJW=DK1:L*.NJW, and ADDRS.NJW=AL*.-NJW. The main benefit to this is that these files, while very small, still waste 16 sectors each on an 8" disk. (After combining them, EDIT19 will let me clean out all the nulls that HDOS has left between the old files. Still more space saving.)

Why ask for a CAT?

I need that CAT because it gives me the order in which HDOS will find the letters. I can check my roughs to see how long a letter is, etc. Then I can put the paper in appropriately. (If it's roughs I'm running out, I just copy the lot on fan-fold paper and cut it up as needed.)

And since we're in the laziness department, let's take another look at that directory listing. If I've filed chunks of an article in sequence (SOP131A, SOP132A, etc.) they *may* come out in the directory in that order. So by typing COPY LP:=SOP13?A.JW, I can get them to print out all in order.

If they don't show up in order, I have to type COPY LP:=SOP131A.JW,SOP132A, etc. True, I save a little time in that I don't have to repeat the extension—but I'm lazy, I'd rather rely on the ? or *. Wouldn't it be nice if I knew that files would print out in the same order in which I filed them?

If I have a clean disk, they do so. The operating system will store one file, then the next, and so on. That's the order in which they'll appear in the directory; and that's the order in which they'll be copied.

However, sometimes I fill up a disk—and then have to clean out space here and there to store new stuff. In that case, the operating system will put new files wherever it feels like. After erasing a few files, the first new file I then store may show up in the directory way below the second and third.

The moral to all this? The work (or money) spent on keeping disks relatively uncluttered lets you be lazy when using the directory and COPY commands. (Not earth-shaking, but it's convenient.) So when I work efficiently, I clean out a whole mess of backup files all at once. Then when I break up a long file into sections, I can usually get it to print out in order by using the ? in the COPY command.

But be careful

There are some limits, of course. On Z-DOS version 1 on the H/Z110 and '120, for instance, you can't use wild cards with the PRINT utility. No sweat: the COPY command works just as well under Z-DOS as it does under HDOS or CP/M. (Those of us who have to switch between systems just have to remember that Z-DOS copies "from... to..." while HDOS copies "to... from...". After writing over a couple of files, I had a reminder taped to the '110.)

More generally, remember that the ? stands for any character in its location—even if it's an empty space. So a COPY LP:=DK1:SOP13? will print SOP13 without any last letter, as well as SOP13A, SOP13B, etc.

And you can't use the * backwards. You can't see the first version of a number of things by asking for a CAT *A.*. Once the computer sees an *, it ignores any other letters until it comes to the dot or to the end.

Deletions, too, become more ominous. You can get overconfident. So make absolutely sure that nothing else has the same characteristics as what you're deleting. DELETE L*.NJW, for instance, not L*.?JW or (worse still) L*.*. You might have one or two letters floating around in something like the .EJW series. And you certainly might have other files beginning with L. Always do a directory before deleting.

(It's nicer, too, when authors have middle initials. I've never had two authors with the same three initials. But I've had a couple of times where two-letter initials duplicated each other. I have learned to be very cautious when cleaning out the files of an author with only two initials.)

But you may already have considered another possible limitation: it seems you have to be using tons of disk space and files to really put a file-naming convention to work.

Well, that's not necessarily true. Even on a 5¼" disk, a good file-naming convention lets you handle a wide variety of file types. You or those working with you only have to look at the directory to see what sort of contents each file has. You can fine tune your convention as narrowly as you need.

So you don't need to have large disks to benefit from a good file-naming convention. And if you *are* using tons of disk space and files, it makes life a *lot* easier.

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There is a growing need for the everyday user of computer systems to be able to take data files home from the office to continue to work on them. The computers at home and at work may both run a version of CP/M, but the disk structures may be incompatible. This is especially a problem in the 5.25″ world. MODIFY 89 was designed to address this problem. MODIFY 89 makes the CP/M operating system access a specified 5.25″ drive as one of the below disk types.
Disks placed in that drive that are of the specified type can be used as if they were one of the standard disk types accepted by the H8, H/Z89 or H/Z90 computers. Thus PIP, STAT, DIR and others will work for that disk also. The price for MODIFY 89 is $49.95.

MODIFY 89 is set for the following disk types:

- Access S.S. D.D.
- Cromemco S.S. D.D.
- DEC VT180 S.S. D.D.
- IBM PC/Zenith 100 (CP/M) S.S. D.D.
- IBM PC/Zenith 100 (CP/M) D.S. D.D.*
- Kaypro II S.S. D.D.
- Morrow Micro Decisions S.S. D.D.
- NEC PC-8001A S.S. D.D.
- Osborne S.S. S.D.
- Osborne S.S. D.D.
- Otrona D.S. D.D.*
- Superbrain Jr. S.S. D.D.
- TI Professional S.S. D.D.
- TRS-80 Model I (Omnikron CP/M)
- TRS-80 Model III (MM CP/M)
- Xerox 820 S.S. S.D.
- Xerox 820-II S.S. D.D.
- Standard (Tests for H/Z37 and C.D.R. Disk types)

* = Double sided 5.25″ drive required

S.S. = single sided, D.S. = double sided, S.D. = single density, D.D. = double density

Limitations: MODIFY 89 is not a disk duplicate program. It is currently available for use with an H/Z89 or H/Z90 computer that has an FDC-880H double density 8″ and 5.25″ controller, using C.D.R.'s BIOS V.2.9 or with an H8 computer using the FDC-H8 by C.D.R. Systems, Inc.

MODIFY 100 will soon be released for the Z100 line of computers at a price of $75.00.

Contact:

C.D.R. Systems, Inc.
7210 Clairemont Mesa Blvd., San Diego CA 92111
Telephone: (619) 560-1272
Or a C.D.R. Systems, Inc. dealer near you.

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Supplier Notes

Computerized Cards for Christmas (and Other Occasions)

CompuGreet offers a line of continuous-form greeting cards. A personal message may be printed inside the cards using a word processor and a printer with tractor feed. Envelopes come attached to fan-fold paper for continuous tractor-feed addressing.

Eight designs are available, including themes for Christmas, birthdays, and all-occasion uses. A package of 20 cards and envelopes costs $9.95. A box of 100 cards and envelopes costs $45, and a box of 300 cards and envelopes costs $130. To order, or to receive further information, contact CompuGreet, P.O. Box 3357, Reston, VA 22090.

CompuGreet offers six Christmas designs, including this one.

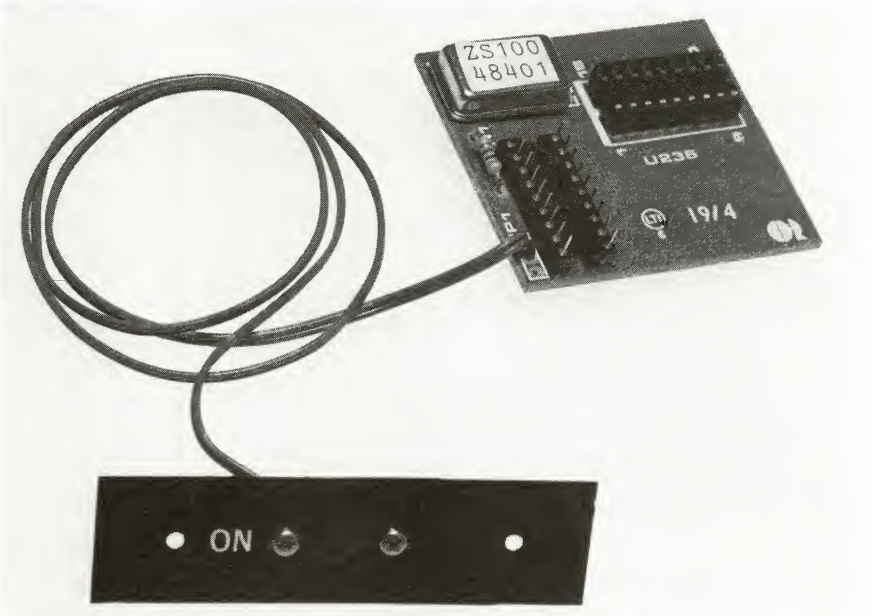
This card design suits any occasion.

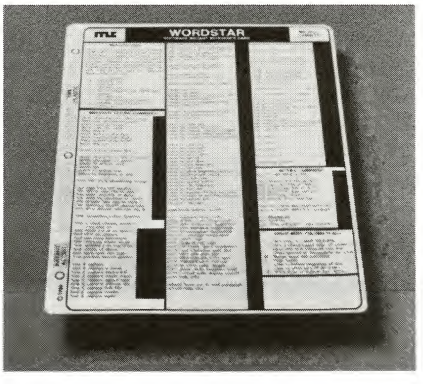
Hardware Module Enables Z100 Computers to Run Faster

By using the Z100 Speed Module (ZS100), users of the Z110/120 can increase the speed of the 8088, the 16-bit microprocessor in the Z110/120, by about 50%.

The ZS100 was developed by Controlled Data Recording (C.D.R.) Systems, Inc. It plugs into the motherboard of the Z110/120 with no soldering. The ZS100 includes a switch that may be attached to one of the connector mounting holes on the back of the Z110/120. Using the switch, the user can choose between fast (7.5 MHz) and normal (5 MHz) operation. Most software packages do not need to be altered to run at the faster speed.

The ZS100 comes with a limited two-year warranty and lists for $49.95. Interested Z110/120 users should contact their local Zenith Data Systems dealer or Heathkit Electronic Center. C.D.R. Systems, 7210 Clairemont Mesa Blvd., San Diego, CA 92111, 619/560–1272.





Quick Access to Control Codes for WordStar™ Users

WordStar™ users can now have easy access to their control codes and other information. WordStar™ commands are summarized on Micro Chart #9 from Micro Logic, printed on both sides of an 8½″ × 11″ heavy plastic card.

The card explains normal commands, dot commands, reforming paragraphs, moving text, moving columns, invisible returns, print-control commands, place markers, the ruler line, column-80 flags, hyphenation, headers, footers, bidirectional printing, micro-space justification, MailMerge, undocumented techniques, ASCII-to-decimal conversion, and more.

Micro Chart #9 costs $5.95 plus $1 for postage from Micro Logic Corp., P.O. Box 174, 100 2nd Street, Hackensack, NJ 07602, 201/342–6518.

HERO Jr.: The Heath Company's Pre-Programmed Personal Robot

The Heath Company has introduced HERO Jr. as "the first fully pre-programmed personal robot." HERO Jr. is intended for use in the home, primarily for entertainment.

HERO Jr. comes with 32K of pre-programmed routines. He can speak English and "Roblish" (a robot's version of English), play games, explore, and act as an alarm clock and security guard. The robot's normal mode allows him to explore at random, avoiding obstacles and seeking out humans. An infrared motion detector is available to enhance the robot's ability to identify humans. A wireless remote-control accessory permits HERO Jr. to be operated manually.

HERO Jr.'s software operation consists of a pre-programmed personality, which requires no user input. The user may adjust HERO Jr.'s personality by varying the dominance of six personality traits. The user may also select any individual task or demonstration mode separately. Multi-tasking software enables HERO Jr. to move and speak at the same time.

HERO Jr. is programmed to greet his companions with such phrases as "I am HERO Jr., your personal robot," and "I am your friend, companion, and security guard." He can inform his owner of the day, date, and time, using an internal clock with a 100-year calendar and automatic correction for Daylight Savings Time.

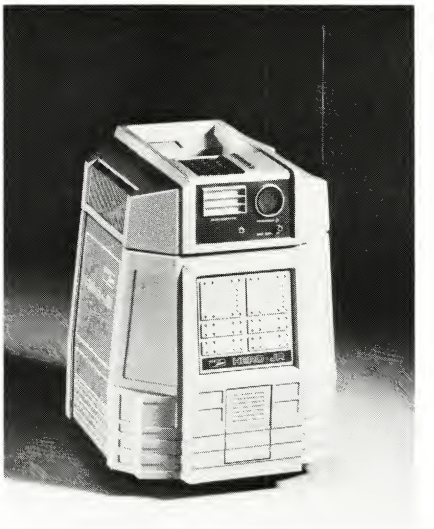
HERO Jr. is 19 inches tall and weighs 21.4 pounds. He resembles Heath's first robot, HERO 1, which was designed to teach Robotics and Industrial Electronics; but HERO Jr. does not have an arm attachment.

HERO Jr.'s three wheels, including a single articulated rear drive wheel, enable him to move about. He can carry up to ten pounds on a compartment in the top of his head. The head is also equipped with a 17-key keypad which permits the owner to modify HERO Jr.'s personality or initiate a special task.

A window for optional infrared motion detection, an ultrasonic Polaroid™ sonar transceiver, and a light sensor compose HERO Jr.'s face. Other transducers provide synthesized speech output and sound sensing.

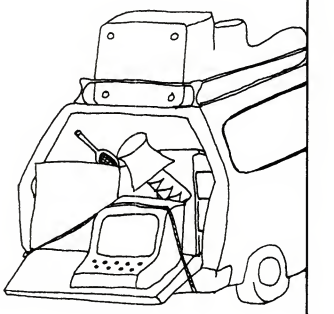
Connectors on the back of HERO Jr.'s head include a charger jack, an on/off slide switch, a sleep switch, and an RS-232 computer interface. (A "HERO Jr. BASIC" cartridge permits programming through the RS-232 interface.) HERO Jr. can be recharged overnight from a plug-in wall charger which comes with the robot. HERO Jr. will operate for 4–6 hours between charges under normal operating conditions.

The Heath GDA-2800-3 RF security transmitter accessory permits HERO Jr. to activate the Heath GD-2800 burglar-alarm system, should the robot detect an intruder who is unable to provide the proper password.



Cartridges can be added to expand HERO Jr.'s repertoire of routines, songs, games, and phrases. An extra battery accessory doubles his operating time.

HERO Jr. is priced at about $1,000 and is planned for sale at upscale department stores and other retail outlets that sell computer games and software. For more information, contact the Heath Company, Dept. 150–375, Hilltop Road, Benton Harbor, MI 49022.



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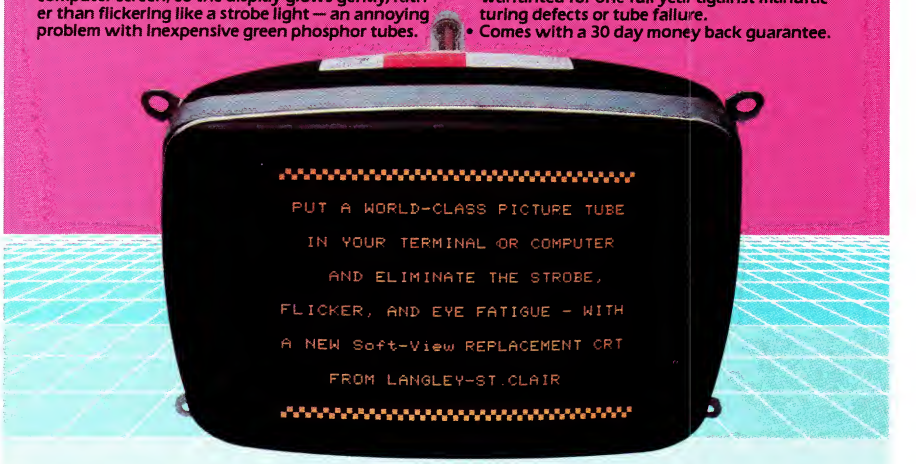
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Scuttlebutt

If you read "Scuttlebutt" in the last issue, you saw that the Los Angeles City Attorney's office had decided **not** to press any charges against **Tom Tcimpidis**. (A Pacific Telephone credit-card number had been put on his and other bulletin boards.) Well, there's a **nasty update** to that story. They've **changed their minds**—bowing to **political** pressure from Pac Tel, according to Tom. Their previous **legal** opinion seems to be taking a **back seat**.

Moving on to more cheerful matters, *Sextant* can neither confirm nor deny rumors that **HERO** is negotiating with **Hollywood** for a starring role in a feature film. However, our film critic caught his performance in "**The Last Starfighter**." "HERO's presence **added greatly to the film's authenticity**." In case you wish to verify that judgement, you should keep your eyes glued on the lower part of the screen immediately after you see the alien (Beta, looking icky) in Alex's bed. Right from there, the scene shifts back to the Rylan command center. And just as Alex is coming out of some sliding doors, there's HERO! For **a full second**, maybe! That is **not** a "bit part." Among show-biz bigtimers, that is what is known as a "**cameo appearance**."

In the September *Byte* (pp. 372–374), **Jerry Pournelle** recommends **three** systems for those in the market for an IBM-**compatible** personal computer.

"For . . . compatibility, a great keyboard, good color, good price, and good service, you'll go a long way before you beat the Zenith Z150 PC. This machine is so nice that Mrs. Pournelle has claimed ours."

For higher speed, more features, but lesser IBM-compatibility, Pournelle suggests the TI Professional. "Finally, there's the Zenith Z100, which isn't as compatible as the Z150 and doesn't have all the features of the TI Professional—but has a lot going for it, including price, lots of software, and the S-100 bus."

Well, **two outa three** ain't bad.

Right now, **you** may be putting in your orders for Thanksgiving turkey, but to us, it's just barely Labor Day—time to say bye to our summer interns. **Dan Conaway** has gone back to Allegheny College in Pennsylvania, **Vickie Saxon** returns to Princeton. And our writing intern, **Dave Felstul**, is going back to H89ville, Minnesota, otherwise known as St. Olaf College.

But it'll be **next year** before you notice that Dave's not here. We still have a couple more articles from him that won't get to you for a little while. (Working on a bi-monthly sometimes feels like being in a continual time warp.)

But as we wave goodbye to the Summer People, Sextant Publishing Co. continues its gargantuan growth. **John Gill** came on board to be **Circulation Assistant**, but has advanced to **Subscription/Retail Service Manager** and **Production Assistant**.

John's successor in office is **Gabriele Burkhard**. So now she's the one who'll get your subscription un-snagged on the rare occasion it gets tangled up in our vast bureaucracy. She comes to us from Germany, by way of George Mason University in nearby Virginia.

And some of our advertisers have already met **Bryan Rutberg**. He's our new **Advertising Sales Assistant**. No one who lives in D.C. or Los Angeles is ever **from** there. So since we're in D.C., it's not surprising that he's from Los Angeles.

But while gaining, we **lose**, too—and not just summer interns.

Fred Zimmerman may have been hit by waves of uncontrollable nostalgia while talking to academic computer users over the University of Michigan's bulletin board. In any event, he decided it was time to head back to the **groves of Academe**.

Fret not, though, that Fred has left computers behind. With all those Z100s (and Z150s) in the hands of novice profs and administrators, he planned to rope in some **consulting business**. "No, no. Don't try to take the disk out of its jacket." . . . "You say you accidentally typed 'ERASE *.*'? And you don't have a backup?" . . . But will his customers realize that he's able to help them because he's done **all of those** things himself? (Who **hasn't**?)

His consulting **may** have been profitable, too. All **we** know is that he's sending us postcards from **London**.

But all that is ancient history from back in September. Let's come out of the time warp somewhat (from your perspective, anyway). Here's hoping we get to see some of you at the **upcoming regional Heath Users' Group** conferences. If you haven't already registered, there might **still be time**.

The **Capital Heath Users' Group** is sponsoring the **Eastern Regional** conference again this year. **CHUGCON 84** will be held on Saturday **November 3**. It's at the Crystal City Hyatt Regency Hotel in **Arlington**, Virginia, near Washington, D.C.'s National Airport and within walking distance of the Crystal City subway stop. Admission is free. (CHUGCON 84, P.O. Box 10515, Alexandria, VA 22310, 703/435–1189, 7–9 p.m. Eastern Time.)

And *Sextant* folks will also be at "**HUGCON West**." The **Western Regional HUG Conference** will be held **November 10 and 11**, at the Disneyland Hotel in **Anaheim**, California. Admission to both the Conference and dinner on the 11th comes to $25. The conference alone is $5 for one day, $7.50 for two. (WRHC Coordinator, Herbert A. Freidman, M.D., 1555 North Orange Grove Avenue, Pomona, CA 91767.

Pretty soon you're going to be making up your Christmas list. So you might want to check out **Hugh Kenner's newest book**. No, it's not about James Joyce or modern Irish writers, not this time, anyway. It's the ***Heath/Zenith Z100 User's Guide***, for $15.95 from William J. Brady Co., a division of Prentice-Hall.

And still in the book department, **Bill Adney** is working on another *Flip-Fast Guide*, this time to **Z-DOS**. Heath/Zenithdom may not have as many books dedicated to it as we'd like, but the number is **rising**.

We close on two related notes. The first is much more somber than we usually carry here.

William Gartelmann, of Apogee Software died this summer of cancer. His products and his personality had built a following among Heath/Zenith users. He was in the center of the cover picture on our Spring 1983 issue, shown demonstrating his software to attendees at CHUGCON 82.

A more hopeful note is that **Walter A. Clayton** is taking over to continue offering the Apogee programs. He intends to keep the line going and has some new products that may be released by the end of the year. The address is still P.O. Box 15124, Savannah, GA 31416. There's a **new telephone number**, though: 912/355–3767.

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